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A predictive statistical model of Navy career enlisted retention behavior utilizing economic variables

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NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

A PREDICTIVE STATISTICAL MODEL OF NAVY CAREER
ENLISTED RETENTION BEHAVIOR UTILIZING ECONOMIC
VARIABLES

by

David Glenn Bradley

December, 1980

Thesis Advisor: Richard S. Elster

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findings indicate Navy policymakers must be cognizant of the
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-

A Predictive Statistical Model of Navy Career
Enlisted Retention Behavior Utilizing Economic
Variables

by

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Lieutenant, United States Navy
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Submitted in partial fulfillment of the
requirements for the degree of

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from the

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December, 1980

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I. INTRODUCTION

The purpose of this thesis is to develop a statistical model of retention behavior of the Navy's career enlisted personnel. These personnel are extremely important to the Navy because of their high levels of training and operational expertise. Very few formal studies have been discovered that address this subject area. For instance, Wool [1] in his chapter on retention references a few studies on careerist retention, but focuses on the reenlistment decisions of first-term enlisted personnel.

The Chief of Naval Operations (CNO), Admiral Thomas B. Hayward in an interview with All Hands [2] , stated:

> Absolutely, for the most part; although not exclusively, the solution to the loss of so many of our best people is money. Too many Navy men and women are just not being adequately compensated for the demanding and highly professional jobs which our country calls upon them to do. No one should expect to have to add the strain of making ends meet to the other demands which Navy life puts upon our people and their families ...

Although the Admiral's position is not universally popular within the Carter Administration, it is supported by others inside and outside the Defense Establishment. The April 1978, Report of the President's Commission on Military Compensation [3] , stated:

> Since the switch to an All-Volunteer Force in 1973, the nation's supply of military manpower has become more dependent on the conditions of the labor market place ... to attract and retain personnel, changes in compensation policies and personnel management became necessary to enable the services to compete effectively with private and other employers.

Additionally, before the House Defense Appropriations Sub-

committee, Assistant Secretary of Defense for Manpower,

Reserve Affairs, and Logistics, Robert B. Pirie [4] testified

that:

> No matter how much our service people may want to make a
> career of the military, I feel that we may be reaching a
> point where they will not be able to afford to remain in
> the service.
>   The evidence of several studies and evaluations made
> in recent months clearly support the fact that the military
> personnel have not shared equally in the growth of salaries
> and wages experienced by other segments of the American
> economy.
>   If we are to attract and retain young Americans to the
> military, we must act positively to reverse both the
> reality and the perception of the past decade.
>   We must make the compensation system for military
> service such that our people perceive them as, at least,
> not a financial burden and, better still, competitive
> with the civilian economy.
>   Military pay increases must continue to be linked to
> private sector pay increases ...

The above views contrast very sharply with the Defense Man-

power Commission [5] which in its April 1976 report to the

President, wrote:

> There is something to military service beyond pay and
> benefits; one serves regardless of recognition or
> appreciation. If this were not so, the professional
> armed forces of the western democracies would not have
> survived the period between the wars. In short, true
> professionals will serve and fight, even if they believe
> they are being neglected. ...

The former views indicate that the most important factors

in the retention of high quality manpower, in the era of the

All-Volunteer Force, are pay and the other factors of

compensation. What this implies is that the modern military

man is very much aware of the economic aspects of his employment and bases his decision whether to remain in the service in large measure on those economic factors.

The focus of this thesis is upon the career enlisted fraction of the Navy's manpower. The careerists for the purposes of this thesis will be defined as those personnel who have completed seven (7) years of service (YOS). These personnel, when making a retention decision, will be making that decision for the second or greater number of times [6] .

Defining careerist narrowly permits the thesis to focus upon a fraction of Navy manpower that is very vital to the Navy if it is to continue to be a strong service.

This thesis assumes the position of The President's Commission on Military Compensation. Specifically, it is assumed that, when faced with a decision concerning leaving the Naval Service each career enlisted man will compare the value of his present compensation and that of the appropriate civilian alternative. After making comparison with the values of the alternatives, the service member will choose the one with the highest present value.

Given the above assumptions, the potential career reenlistee may determine wages and other economic factors, i.e., a reservation wage, RMC and other benefits that would make the sum of the benefits of becoming a civilian just equal to the benefits of remaining in the military. At this wage and benefit combination, W*, the potential career

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reenlistee would be indifferent between reenlistment and becoming a civilian. If the military compensation package, Wo, actually available to the potential career reenlistee exceeded his reservation wage[1], then he or she would reenlist. If the reservation wage was greater than Wo, then he or she would not remain in the service. References 7 and 8 give an excellent explanation of the behavior of individuals in the evaluation of the economic factors of employment.

There exists among the potential career reenlistees wide personal differences in reservation wages. Such differences result from the varying opportunity costs of reenlisting and perceived differences in the non-monetized aspects of continued military service. For example, a potential career reenlistee (careerist) with excellent civilian opportunities and poor taste for continued military service will, ceteris parabus, possess a high reservation wage. The potential careerists could be arrayed in a frequency distribution according to their reservation wages as shown in Figure 1 [9] .

The aggregate supply curve as a function of expected economic benefit (all non-monetized factors held constant)

---

[1]The reservation wage is the wage or combination of wages and benefits that are equal to the highest alternative wage and benefit package available to an individual [7,8,10,11] . Thus, reservation wage is the compensation necessary to maintain a person's employment, or to induce that individual to join another organization.

Number of eligibles who would reenlist

Wo = Wages and Benefits available at a point in time to careerists

W* = Reservation wage

0

Wo

Wage W*
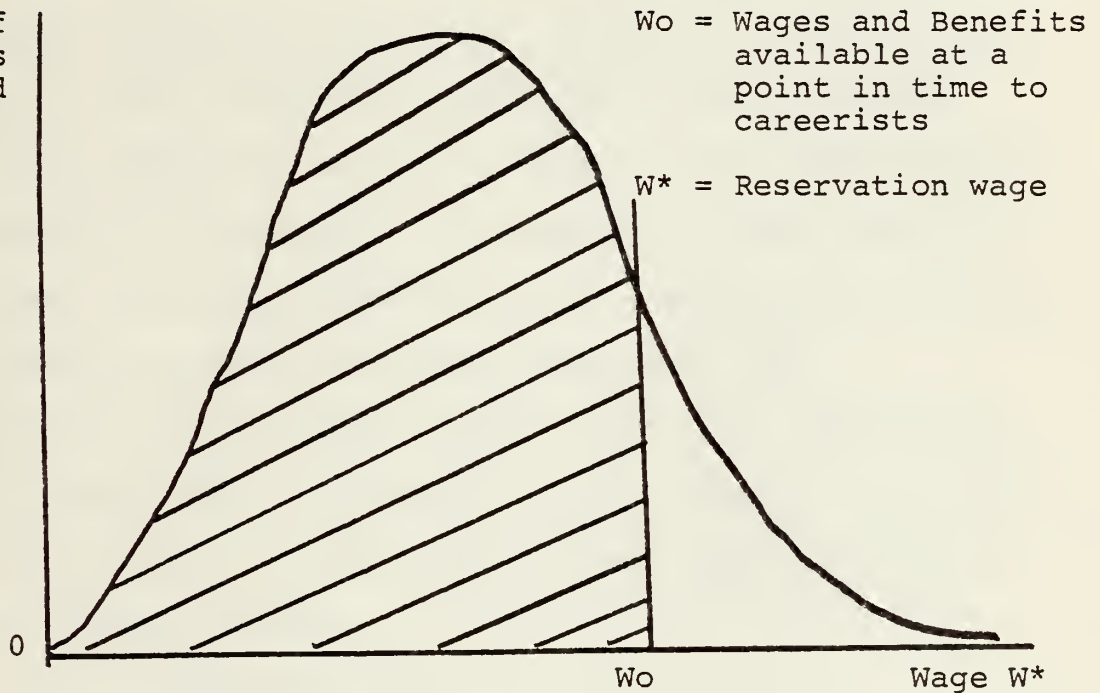
1. The idea of the frequency distribution is adapted from Darling [9].

2. Shaded area is cumulative number who would reenlist at Wo, (W*<Wo)

3. The cumulative number who would not reenlist, (W*>Wo)

4. The point of indifference would be equality, (W* = Wo) [7].

FIGURE 1. Theoretical Frequency Distribution of Career Reenlistments

may be generated by plotting the number of those who would reenlist at each level of expected economic benefit.

The derivation of the supply curve in Figure 2 was heuristic, and is for purely pedagogical purposes. Typical non-monetized factors of the career retention decision process of a careerist are: (1) Knowledge of the civilian labor market [9,12], (2) Taste for military life [13,14,15], and (3) Family and spousal pressures arising out of extended separations induced by duty [16]. The first factor varies according to the individual and generally has an inverse relationship with the level of economic activity [8,13] upon the retention of careerists. The second and third factors are probably the more important of the non-monetized factors in the decision process for many careerists [14].

The previous discussion suggests that the reenlistment rate of career enlisted personnel may be viewed as a function of several economic factors, with a small contribution by the non-economic factors:

$$RR = f(W,R,U,C,I,D)$$

where

RR = Reenlistment Rate of career enlisted personnel

W = Wages expected from military service

R = Ratio of military wage to civilian wage

U = Unemployment rate in the civilian economy

C = Civilian wage that is appropriate as a reference

I = Index of wages and salaries in the civilian economy

D = Dummy variable representing the Military Draft (1=Draft, 0=No Draft)

Total
Eligible
to
reenlist

Number
who
Reenlist

0   Wo   Expected Economic
                                                           benefit of Cont.
                                                           Military Service
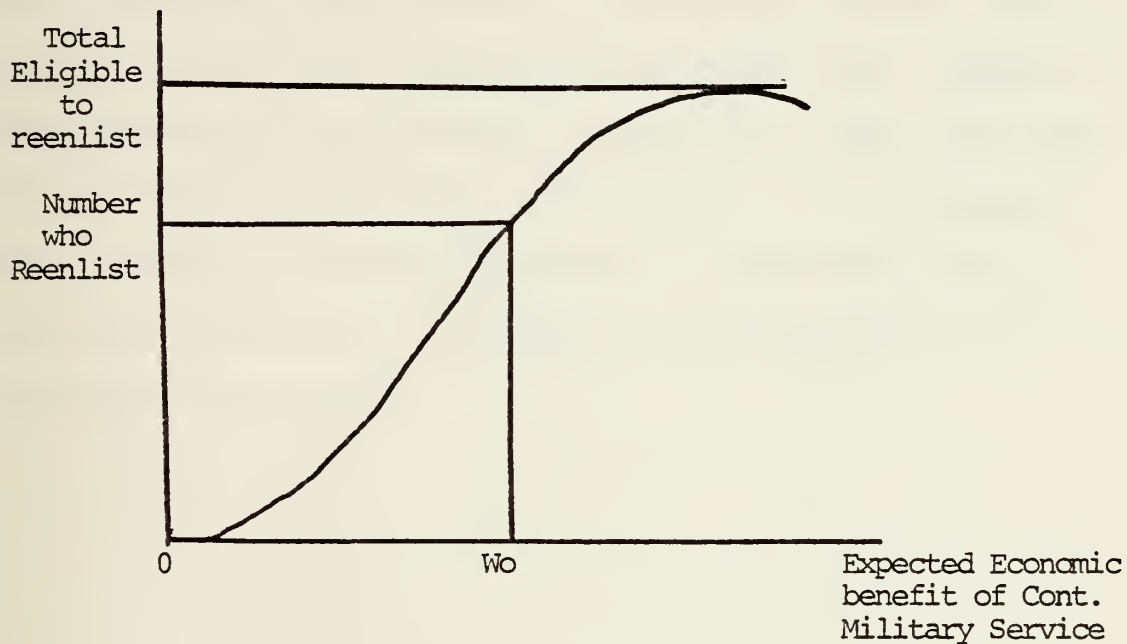
1. The figure was developed from ideas advanced by
    Darling [9] .

2. Wo is the total of wage and benefits at a point in
    time that is available to the potential careerist.

FIGURE 2.   Aggregate Supply Curve of Career Reenlistees

There are two methods of analysis commonly used in examining the retention behavior of the careerists: (1) Survey information, and (2) Statistical modeling of the retention decision. Survey data brings into view the non-monetized aspects of the decision process, and are therefore useful. On the other hand, however, non-monetized aspects of the decision process have been inordinately difficult to quantify, and are not included in the analysis in this thesis. This thesis pursues the already quantified economic aspects of the reenlistment decision of the careerist and develops a statistical model based upon those factors. The task of the analysis is to develop a valid model to explain careerists' reenlistment behavior. Multiple regression was chosen as the technique to be used to develop the model.

II. TRENDS AND IMPACTS OF CAREER ENLISTED REENLISTMENT BEHAVIOR

No completed study was discovered that dealt with the
retention behavior of the enlisted careerist, although Binkin
and Kyriakopoulos [17] addressed some of the force impact
aspects of the problem of low career retention. It is under-
stood, however, that various organizations are developing
models which attempt to predict the retention impacts of
changes in military retirement programs. Studies prepared
for the President's Commission on an All-Volunteer Armed
Force [18] and one by Attergott [19] have dealt with the
factors affecting the retention behavior of first term
enlisted personnel. Parker [20] dealt with the retention
behavior of Surface Line Officers at the end of their initial
service obligation. Altergott [19] attempts to use economic
factors to describe the behavior of first term enlisted
retention behavior based upon the perceived value of
compensation. Additionally, Parker [20] applied the same
principles to a segment of the officer corps of the Navy
and developed a model for predicting the retention behavior
of Surface Warfare Officers. Altergott [19] developed a
pay elasticity to illustrate the changes in first term
retention due to a change in the military wage.

The dearth of coverage in the literature on the retention
behavior of career enlisted personnel means a most important

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segment of the military force has been ignored. Career enlisted personnel are those defined here as personnel with more than seven (7) years of service (YOS). This elimates all the first reenlistment and first enlistment personnel, limiting this study to personnel predominately in pay grades E-5 through E-9. The retention behavior of enlisted personnel making retention decisions at the expiration of active obligated service (EAOS) for the second or greater number of times was the focus of this thesis.

The U.S. Navy is 43,000 men short of the number of men required in the pay grades E-5 through E-9, based upon a force of 460,000 personnel [21]. The Navy's end of year strength in 1979 was 457,102 people, or less than one percent short of the 460,000 amount upon which the 43,000 shortage was based. Vice Admiral Robert B. Baldwin, recent Deputy Chief of Naval Operations for Manpower, Personnel, and Training, indicated the Navy was 20,000 petty officers short of the requirements for a force of 460,000 personnel [22]. Because of the shortage of careerists, the Navy has pursued the manning of ships with a personnel policy euphemistically named, "the one up and one down" [23,24]. What this policy dictates is that a job requiring a particular pay grade, for example E-5, may be filled by a person of one higher grade, an E-6, or a person of the lower grade, an E-4. In very rare circumstances billets are filled with personnel of a higher paygrade [24]. The preponderant situation is

the reverse with lower rated personnel manning billets requiring paygrades higher than their own [24] . The manning of sophisticated equipment by personnel who are lower in operational experience and training raises serious questions about the experience and training pool of the force.

Complicating the problem of generating sufficient numbers of petty officers to man the ships, aircraft, and shore facilities, is the trend of declining career retention in the Navy [24] , a problem which has persisted since 1973 and the introduction of the All-Volunteer Force. The All-Volunteer Force was ushered in with the belief [25] that the manpower of that volunteer force would be retained at a very high level. The retention rates, however, have been the opposite of what was expected when the All-Volunteer Force concept was introduced [26,27] .

TABLE 1

Career Retention, Navy [24]

Fiscal Years	1972	1973	1974	1975	1976	1977	1978	1979
Career Retention	91.0	91.7	80.3	80.5	74.8	68.1	65.5	62.2

1. Careerists are the personnel who have completed more than 7 YOS.

2. The Career Retention percentage is the percentage of careerists who reenlist of those eligible to reenlist for the second or greater number of times.

The decline in the retention of the careerists by the Navy not only helps explain the shortage of petty officers in the

Force, but it also illustrates a cause of the high number of very junior petty officers in the Navy [14] . The lack of people in the career category in the Navy leaves a gap of experience that the Navy is attempting to fill with personnel of lower experience and training [24] .

The experience possessed by the career petty officer is something that must be created through years of service. The acquisition of a first class petty officer, E-6, requires an average of 8.5 YOS [26] by the service member. The recruitment of more than one person to obtain one careerist E-6 is necessary because attrition rates lower the numbers of personnel surviving the initial enlistment obligation. The attrition rate of first term enlisted personnel in 1979 was 28 percent [6] and the first term reenlistment rate was 37 percent of those eligible [6] . If one assumes a first term eligible to reenlist percentage of 80 percent, which is much higher than previous historical trends would indicate [27] , the number of personnel reenlisting at the end of the first enlistment is 21.3 per 100 initial enlistees. If one now assumes that the future E-6 required reenlisted the first time for four years, following an initial four year obligation, one discovers that person must be reenlisted a second time, on average, if the Navy is to get a new E-6. The assumption of the second reenlistment is not unrealistic, because the personnel in critical ratings, those with worse than normal petty officer manning [28] , can obtain the maximum possible

reenlistment bonus by reenlisting for only four years
because of the way the bonus is computed [28] . Thus, the
second reenlistment becomes necessary to generate the average
8.5 years of service.

The career reenlistment rate in 1979 was 62.2 percent for
the Navy, which shows that out of the original 100 personnel
enlisted, only 13^2 remained who might eventually have an
average of 8.5 YOS typical of an E-6 [26] at the time of
promotion to that paygrade. As a consequence of the high
attrition rates and relatively low reenlistment rates, first
term and career, the Navy must recruit six (6) personnel, a
very conservative estimate, to obtain one first class petty
officer with 8.5 years of service.

The decline in career reenlistment rates has lowered the
experience and expertise level of the manpower of the Naval
Force. The 62.2 percent career reenlistment rate is the
lowest the Navy has experienced [24], and the trend during the
entire period of the All-Volunteer Force has been toward a
decreasing career reenlistment rate. If the Navy is to

_____

^{2}100 initial enlistees x 0.72 (first-term attrition rate
= 0.28) = 72 remaining after the first enlistment. 72 x 0.80
(0.80 is the eligible to reenlist percentage after the first
enlistment) = 57.6 or 58. 58 x 0.37 (0.37 equals the first
term reenlistment percentage in 1979 for the Navy) = 21.46 or
21. 21 x 0.622 (0.622 equals the career reenlistment percentage
for the Navy in 1979) = 13.062 or 13. 13 personnel remain
in the Navy after two enlistments with eight years of service
with the potential to become an E-6.

improve its level of operations, the experience and expertise

of its personnel must be increased and maintained at very

high levels.

Quite to the contrary, however, the readiness of the Navy

has been declining and will decline at an increasing rate

unless the experience and expertise of the personnel manning

in the Navy is improved. Admiral Hayward, CNO, stated in

testimony before Congress that:

> ... too many of our most talented people... continue to
> vote with their feet, and the downward spiral of unit
> readiness which we already find alarming will defeat our
> best efforts... [29]

The implications of shortages of career personnel in the

paygrades E-5 through E-9 are very clear. Without them the

Navy will deteriorate. The problem of poor retention is

synergistic for future retention because the shortage of

trained, experienced personnel necessitates that the remaining

personnel be pushed to work harder and to put in longer hours

[29]. What person will voluntarily remain in a position

where the future offers only increasing work loads and hours

for pay and benefits that are not increased with the longer

harder hours?

Recently, the Navy had only six (6) out of thirteen (13)

aircraft carriers and ninety-four (94) out of one hundred

fifty five (155) Naval aircraft squadrons in a combat ready

status [30]. The overwhelming cause of the low level of

readiness was personnel shortages in the petty officer

billets of the level E-5 through E-9. These career enlisted

personnel are the key to keeping the Navy operating, and they

must be retained in greater numbers than has been demonstrated

over the past several years.

How did the Navy come to the current state of affairs?

The position of this paper is that the major causes of the

career personnel shortage problems in the era of the All-

Volunteer Navy have been economic. As shown in Table II the

value of pay for the E-5 through E-9 enlisted man has steadily

declined since 1973 when examined in constant 1979 dollars [31].

The simple single variable linear regression of regular military

compensation (RMC) of the E-5 through E-9 personnel in constant

1979 dollars with the career retention percentage yields an

r^2 value of 0.7619, which indicates a very strong relationship

between pay and career retention in the period 1971-1979 (the

career retention percentages can be found in Table I).

TABLE II

Career Enlisted Pay E-5 through E-9

Fiscal Years	1972	1973	1974	1975	1976	1977	1978	1979
Const $ RMC E-5- E-9	1517.28	1599.98	1523.05	1445.05	1403.60	1386.71	1342.05	1282.38

1. Source of the pay schedules used in the computation: Navy Accounting
    and Finance Office, Washington, D.C.

2. Constant dollar index constructed by this investigator from the index
    of all services less rent from The Economic Report of the President 1980.

The examination of the career retention data from 1956
through 1979, using only constant dollar E-5 through E-9 found
in Table III, RMC as a predictor, yields an r^2 of 0.17. The
condition suggests that there is inconsistency prior to 1973
in the relationship and a tight correspondence subsequent to
that date. A major factor that distinguished 1973 from the
other years was the beginning of the All-Volunteer Force in
the U.S. Military that year [6,32]. Conscription was no
longer used as of 1973 as a means for acquiring military
manpower. The rules governing the recruitment and retention
of manpower were changed. This thesis takes into account
the effect of the change resulting from the All-Volunteer
Force.

The decision was made through the political process [3]
to have the military acquire its manpower from the labor
market on a competitive basis with the other participants
in that market. The key word, in the acquisition of manpower
from an open labor market, is competitive. Being competitive
in the labor market requires compensation levels that are
sufficiently attractive to the potential employees in that
market to induce them to seek employment with a particular
employer. The U.S. Armed Forces are clearly, under the
all-volunteer concept, not competitive, if the retention
data for the career personnel are used as an indicator. The
retention of these personnel is an indication of the
competitive position of the military with respect to the
others participating in the market.

Table III

An Initial Look At The Variables

Years	RMC E-6 (a)	Career RMC (b)	Wage Index (c)	Navy Career Retention Rate (d)	Unemp. Rate (e)
1956	1136.66	1137.73	3.493	94.9	4.1
1957	1094.60	1096.12	3.341	85.8	4.3
1958	1119.66	1328.06	3.205	89.0	6.8
1959	1086.23	1268.28	3.100	90.1	5.5
1960	1054.20	1229.37	2.990	90.9	5.5
1961	1030.51	1207.58	2.918	91.0	6.7
1962	1013.87	1181.71	2.865	92.2	5.5
1963	1031.86	1334.10	2.805	93.3	5.7
1964	1032.12	1335.42	2.745	90.1	5.2
1965	1150.14	1359.05	2.676	87.3	4.5
1966	1176.76	1392.55	2.569	89.6	3.8
1967	1172.42	1390.81	2.449	80.9	3.8
1968	1169.78	1411.29	2.316	79.4	3.6
1969	1187.66	1416.85	2.152	78.4	3.5
1970	1164.02	1391.22	1.979	83.7	4.9
1971	1169.14	1400.26	1.872	90.0	5.9
1972	1264.42	1517.28	1.802	91.0	5.6
1973	1329.52	1599.98	1.727	91.7	4.9
1974	1266.49	1523.05	1.569	80.3	5.6
1975	1199.70	1445.05	1.420	80.5	8.5
1976	1163.58	1403.60	1.311	74.8	7.7
1977	1151.01	1386.71	1.215	68.1	7.0
1978	1113.07	1342.05	1.116	63.5	6.0
1979	1063.10	1282.38	1.000	62.2	4.2

Variables:

(a)   E-6 means paygrade E-6, and E-6 RMC is in constant 1979 dollars.

(b)   RMC means regular military compensation and Career RMC is the arithmetic average of RMC for E-6 through E-9 in constant 1979 dollars.

(c)   Wage Index means the index of all services less rent taken from The Economic Report of the President, 1980; base 1979=100.

(d)   Navy career retention rate is the percentage equal to 100 times the number of career reenlistees divided by the number of careerists eligible to reenlist. The Navy career retention data were supplied by M.A. Mackey of the Office of the Secretary of Defense, Deputy Assistant Secretary Military Personnel Policy, Director of Enlisted Personnel Management at the Pentagon.

(e)   Unemployment rate was taken from U.S. Department of Labor, the Bureau of Labor Statistics, and is the Nationwide Unemployment rate.

The emphasis on economic factors in the retention of career personnel does not deny the validity of other explanations of the retention problem. Rather, it demonstrates the strength of the economic issue when operating in an open labor market that responds to the forces of economics. If the U.S. Military, and the U.S. Navy in particular, are to work effectively in a market economy for labor, then the compensation levels will have to remain competitive if they are to maintain a manpower force that is both highly experienced and well trained.

The lack of experienced, trained personnel recently resulted in a Navy ship in Norfolk, Va., the USS Calooshatchee (AO-88), being tied up, as have several ships in San Diego [33] . The undermanning of the ships and aircraft in all important petty officer areas does not illustrate the full extent of the problem. The new ships being acquired require a higher percentage of petty officers, and trained personnel in general, than did the units they replaced [21] . The Navy-wide authorized level of petty officer density is 68 percent [21] but the present percentage is barely 62 percent.

The future holds no comfort, because the requirement for petty officers increases as new ships are introduced. The Ticonderoga CG-47 class ship will require a crew that is 85 percent petty officers, and the Trident Ballistic Missile Submarines will require 91 percent petty officers in their crews [21] . The Navy, along with the rising requirements

for petty officers, faces an escalating training load due to the more technically sophisticated equipment it has been procuring. The Sumner DD-692 class destroyer required 63 manweeks of training investment in the crew to operate and maintain the installed AN/SQS-23 sonar suite [21] . The Spruance DD-963 class destroyer, replacing the Sumners, requires 718 manweeks of training investment in the crew to operate and maintain the AN/SQS-26 installed sonar suite [21]. These are but two examples of the changes occurring in the complexity of the hardware the Navy is procuring, intensifying an already critical situation.

If the increasing technical complexity of the hardware is coupled with the declining retention of the most highly trained and experienced personnel, the situation will deteriorate unless the career retention trend is reversed. Not only will the readiness of the existing ships deteriorate, but there will not be sufficient personnel to man the new ships coming into the inventory of hardware. A situation of declining career retention and an increased demand for petty officers because of the petty officer higher density levels required by the new ships, would result in a rapid decrease in the level of readiness.

The problem of inadequate career retention must be solved for three primary reasons: (1) Readiness has suffered, (2) New ships require more petty officers, and (3) The career retention problem is synergistic: self-generating a descending

spiral of resulting lowered retention, leading to even longer
work hours, etc. The increasing work loads and poor conditions
which result from the low and decreasing career retention will
continue to feed upon themselves and, unless solved...

III. UNDERSTANDING CAREER RETENTION BEHAVIOR IN THE NAVY:
PRELIMINARY ANALYSES AND PREDICTOR DEVELOPMENT

After recognizing career retention as a problem area, the
next task is to understand which factors influence career
retention. As previously stated, the position of this paper
is that economic factors play a dominant role in the retention
decision of the careerist. The first step, then, is to discover
which economic variables are effective predictors of career
retention rates.

A. PRELIMINARY ANALYSES

1. Regular Military Compensation

The first variable considered was pay in the form of
regular military compensation (RMC). RMC is composed of basic
pay, quarters, and subsistence allowances (either in kind or
cash), and the tax advantage on those allowances [27]. The
concept of tax advantage requires some amount of explanation.
The tax advantage accrues because the allowances portion of
RMC is not subject to income taxes [28].

Binkin (1975) assembled RMC from basic pay, basic
allowance for quarters, and special pay [16]. The RMC
developed in this thesis was similar to Binkin's, and was
constructed of basic pay, basic allowance for quarters (BAQ),
and sea pay. After the RMC variable was constructed from the
three items (basic pay, quarters allowance, and sea pay) it

was then computed in constant 1979 dollars, yielding a
schedule of RMC that reflects the impact of inflation upon
the RMC. Examining Table III, it is clear that beginning in
1956 the level of RMC for an E-6, on sea duty with over eight
years of service drawing BAQ, has varied considerably over
the period extending through 1979. Comparing the RMC of an
E-6 in constant dollars with the rate of career reenlistment,
it appears there is some relationship, but it is not statis-
tically significant, as shown in Table IV.

Refining the concept of RMC in constant 1979 dollars,
a variable Career RMC was constructed by computing the RMC for
E-5, E-6, E-7, E-8, and E-9s from Appendix A, and taking the
arithmetic average of the RMCs for those paygrades. The previous
discussion concluded that the career population of the Navy was
composed predominately of E-5s through E-9s, and a Career RMC
variable would, thus, more correctly describe the pay of those
careerists. The Career RMC (CRMC) was utilized for the
remainder of the analyses in this thesis.

2. Unemployment

Another factor that could be considered by someone
making an employment decision is the unemployment rate. The
unemployment rate should indicate to the potential reenlistee
something about his employment opportunities if the decision
is made to leave the service. Consequently, the unemployment
variable should be included by the careerist in his decision,
and in any analysis of retention behavior based upon economic

variables. The unemployment rate selected was the nationwide unemployment rate [34,35] , and is shown in Table III.

Regressing CRMC against the Navy career retention rate yields the results contained in Table IV. The results are not conclusive, but regression number two in Table IV indicates that the addition of the unemployment rate does slightly improve the ability to predict Navy Career Retention. In an attempt to provide a better predictive relationship, additional predictor variables were constructed.

B. DEVELOPMENT OF ADDITIONAL PREDICTORS

1. Mean Wages Nationally by Region (MWN)

A careerist making a decision of whether to remain in the service could be observing conditions of employment and pay of people in the area where he or she was serving. A variable was constructed to indicate civilian pay of industrial production workers for eleven areas of the United States where the Navy has ships or submarines homeported: (1) San Diego, (2) Los Angeles-Long Beach, (3) San Francisco, (4) Bremerton, Wa., (5) Honolulu, (6) Jacksonville, Fa., (7) Charleston, S.C., (8) Norfolk, (9) New London (New Haven), (10) Newport, R.I., and (11) Philadelphia. Table V displays the mean wages for those areas in unstabilized and in constant 1979 dollars using the Wage Index developed and displayed in Table III. The mean wage of the national regions demonstrated what a careerist possibly could use as a reference for his potential earnings, if he decided to leave the service.

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Table IV

Initial Regression Results: Navy Career Retention Rate Predicted by Career RMC and Unemployment Rate[1]

Regression No. 1
    y = Navy Career Retention Rate (1956-1979(
    x = Career RMC

ANOVA

Source	DF	Sum Squares	Mean Square	F-Ratio
Regression	1	5.6957E+1	5.6957E+1	6.5177-1 NS
Residual	22	1.9222E3	8.7373E1	
Total	23	1.9791E3		

R Squared: 0.028
STD Error: 9.347

	COEFFICIENTS	T STATISTICS
Const	101.7139	4.6476 < .01 [36]
CRMC	-0.013	-0.8073 NS

Regression No. 2
    y = Navy Career Retention Rate
    x = Career RMC and Unemployment Rate

ANOVA

Source	DF	Sum Squares	Mean Square	F-Ratio
Regression	2	6.9863E+1	3.4932E+1	.384E-1 NS
Residual	21	1.9093E3	9.0918E+1	
Total	23	1.9791E3		

R Squared: 0.035
STD Error: 9.535

	COEFFICIENTS	T STATISTICS
Const	103.8235	4.5109 < .01
CRMC	-0.0123	-0.7424 NS
UNEMP	-0.5753	-0.3769 NS

[1] The regressions reported in this thesis were conducted using an interactive program of software developed at the Naval Postgraduate School by F. Russel Richards [37] . The software permits the analyst to work quickly on a data set from an interactive computer terminal, and accomplish in minutes data manipulations that could require many days otherwise.

Note: NS means not statistically significant

2. Military/Civilian Pay Ratio (M/C Ratio)

Another variable that might be related to careerist retention rates is the ratio of CRMC to the mean wage nationally (MWN). For this thesis both were constructed in constant 1979 dollars. Appendix C demonstrates the method of construction of this variable. The mean national wage portion of the ratio was adjusted to include the fringe benefit percentage portion of the ratio was adjusted to include the fringe benefit percentage portion of the civilian salaries in order to equitably compare CRMC and mean wages [34,35] . The CRMC variable includes the benefits of sea pay and quarters allowance, and it was concluded that civilian wages should be adjusted to include fringe benefits.

The ratio constructed also provides a measure of how the pay of the military has changed relative to the pay of the civilian labor force during the years 1956-1979. Table VI illustrates that the pay of the careerist during the years 1956-1979 has been below the pay of the manufacturing non-supervisory worker 13 of the 24 years. Beginning in 1967, careerist's pay, however, was rising more rapidly than was that of workers in the civilian sector. Military pay was higher than civilian manufacturing non-supervisory pay until 1977, when it slipped below equality. The period of highest relative position of military pay, 1967-1976, was also a period of high career retention.

Additionally, it is evident that as the ratio of pay began declining, so also did the level of career retention in the Navy. Viewing the data of Appendix D, it is evident that the careerist retention rate patterns of the other services were very similar to those in the Navy over the same time span.

3. Civilian Wages of Navy Jobs (CWNJ)

A variable was constructed to reflect the level of wages of the civilian personnel performing the same type of job as performed by Navy enlisted personnel. The ratings were grouped according to the categories developed in 1979 by Chipman and Mumm [38] , and then converted to the appropriate civilian jobs and pay using the Occupational Conversion Manual [39] and Wages and Earnings, United States [33,34] . Following the conversion of the Navy ratings to their closest civilian equivalents, the civilian jobs were assigned the salary of non-supervisory employees in that particular job. Appendix E contains the data used in the development of the variable, Civilian Wages of Navy Jobs. The purpose of using the non-supervisory wage was to use the minimum wage that the Navy careerist would be likely to receive in that civilian job. Although it is recognized that many of the senior Navy personnel would immediately assume supervisory positions in the civilian sector, the decision was made to take a very conservative position to avoid overvaluing the pay of civilian workers. Thus, if the analysis were to err, the error would be in the conservative direction.

Table V

Mean Wages Nationally For Selected Areas of Country

Year	Weekly Wages	Mean Wages Const 1979 Dollars (Monthly)	Year	Weekly Wages	Mean Wages Const 1979 Dollars (Monthly)
1956	78.34	1185.85	1968	125.76	1352.54
1957	81.18	11.75.35	1969	133.47	1244.65
1958	84.17	1168.92	1970	139.49	1196.24
1959	88.93	1194.57	1971	146.56	1188.89
1960	91.17	1181.27	1972	155.69	1215.73
1961	94.61	1196.29	1973	167.80	1255.03
1962	98.35	1221.03	1974	176.18	1197.84
1963	101.41	1202.34	1975	197.21	1212.64
1964	104.58	1244.01	1976	211.16	1206.92
1965	109.41	1268.72	1977	230.85	1215.42
1966	116.08	1292.25	1978	254.99	1233.13
1967	118.05	1252.82	1979	274.27	1188.50

Note: The wage data are for non-supervisor production employees in manufacturing. The data were taken from the Bureau of Labor Statistics Tables (Wages and Earnings in U.S.)

==

Table VI

A Comparison of the Ratio of Mil/Civ Pay and Navy Career Retention

Year	1956	1957	1958	1959	1960	1961	1962	1963
Mil/Civ Ratio	0.869	0.869	1.058	0.984	0.960	0.929	0.887	0.9893
Navy Career Retention	94.9	85.8	89.0	90.1	90.9	91.0	92.2	93.3
Year	1964	1965	1966	1967	1968	1969	1970	1971
Mil/Civ Ratio	0.9804	0.9783	0.9770	1.0056	1.0101	1.0255	1.0431	1.0506
Navy Career Retention	90.1	87.3	89.6	80.9	79.4	78.4	83.7	90.0
Year	1972	1973	1974	1975	1976	1977	1978	1979
Mil/Civ Ratio	1.1064	1.1176	1.1095	1.0578	1.0484	0.9702	0.9208	0.9075
Navy Career Retention	91.0	91.7	80.3	80.5	74.8	68.1	63.5	62.2

The Civilian Wages of Navy Jobs (CWNJ) variable provides a measure of the wage level a Navy careerist could expect if he or she were to leave the service and work in the same type of job. The pay in similar civilian jobs would be an appropriate reference for the careerist making a retention decision, and should be tested to determine if it is predictive of careerist retention rates.

4. Index of All Services Less Rent (Wage Index)

The index of all services less rent was selected from the Economic Report of the President [40] as being the most representative of wages. Since the purchase of a worker's services is very similar to the purchase of any other service, it was felt that it represented a useful picture of the wage changes in the nation. The Wage Index variable in Table III was converted from Base 1967 = 100 to Base 1979 = 100 to permit judgment as to the movement of wages while removing the effects of inflation. The arrangement of the index is such that it shows a decrease in monetary value rather than the more conventional increase in percentages. The index can be readily converted to the conventional form by simple arithmetic operations, but its value lies in the aid it provides in the analysis of wage increases. The increases are deflated, and the changes in real pay are revealed.

5. Draft vs AVF

A dummy variable labeled "Draft" was constructed to reveal if the switch from conscription to the All-Volunteer Force was related to Navy Career Retention behavior. The draft was considered to be an economic variable because of the conscription tax [31] it imposed upon those who were forced to serve under that set of circumstances. The economic cost of conscription was borne by the inductees under conscription [32]. The elimination of the conscription tax was one of the reasons for the institution of the All-Volunteer Force [25] when the AVF vs draft issue was decided.

The dummy variable for the period of the draft was assigned a value equal to one (1), and a value of zero (0) for the years of the All-Volunteer Force.

6. End Strength of the Navy

The end strength for the Navy was used to ensure that its relationship to the retention behavior of the career force was controlled.

7. Variations of the Unemployment Variable

a. Lag-unemployment Rate

Unemployment was lagged one year to examine whether the careerists were making retention decisions based upon the previous year's unemployment.

b. Lead-unemployment Rate

Unemployment was led one year and examined to determine if there was an "anticipatory" relationship" between career retention and unemployment.

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c. Changes in Unemployment

    The change in unemployment rate from year to year
was used to test if the change in the unemployment rate
predicted the career retention rate.

8. Other Variables Examined (Data for all of these variables
are in Appendix F)

    a. Mortgage Rates

    Because of the possible relationship between the
housing market and career retention, this variable was examined.

    b. GNP

    GNP was examined to determine if the overall state
of the economy had an influence on retention rates.

    c. Net National Income

    This variable was examined as a possible predictor
of general overall wage activity and economic activity.

    d. Career Eligible to Reenlist

    The variable was examined because it represents
the population of potential reenlistees.

IV. ANALYTICAL RESULTS

A. VARIABLES FOUND TO HAVE SIGNIFICANT RELATIONSHIPS WITH CAREERISTS RETENTION RATES

The statistical analysis, model construction, and model validation were accomplished using the interactive methods described in A Users Guide to the OA 3660 Workspace [37] . The first efforts concentrated on varying the number of predictor variables. Regressions with one and two predictor variables were previously shown in Table IV.

1. Multiple Regression Results

The first extensions in the multiple regression results used three predictor variables: (1) Career Military Compensation (CRMC), (2) Unemployment (UNEMP), and (3) Wage Index. The result of the regression analysis with these three predictor variables is shown in Table VII. The results show a very significant improvement in the R^2 and the F-ratio over those shown in Table IV.

Although the results shown in Table VII were considered good, it was decided to increase the number of predictor variables in the analysis to five.

The results in Table VIII using five predictor variables were very encouraging.

The results of regression number one in Table VIII show an R^2 of .83 and an F-ratio of 17.336. The F-ratio is much larger than the magnitude required for statistical

Table VII

Initial Three Variable Analysis

x = CRMC and UNEMP and Wage Index

y = Careerist Retention Navy (NAVRET)

ANOVA

Source	DF	Sum Squares	Mean Square	F-Ratio
Regression	3	1.5317E3	5.1057E2	2.2821E1<<.0
Residual	20	4.4744E2	2.2372E1	
Total	23	1.9791E3		

R Square: 0.773

STD Error: 4.729

	COEFFICIENTS	T STATISTICS
CONST	-12.9224	-0.7019 NS
CRMC	0.0423	3.9739 < .002
UNEMP	1.3809	1.7371 < .10
WAGE INDEX	14.2789	8.0834 < .002

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Table VIII

Predicting Career Retention Rates Using Different Sets of Five Predictor Variables.

Regression No. 1
x = Career RMC (CRMC) and Unemployment Rate (Unemp) and
Military/Civilian Pay Ratio (M/C Ratio) and Civilian
Wages for Navy Jobs (CWNJ) and Index of all services
less rent (Wage Index)
y = Navy Career Retention Rate (NAVRET)

ANOVA

Source	DF	Sum Squares	Mean Square	F-Ratio
Regression	5	1.6393E3	3.2785E2	1.7363E1<<.01
Residual	18	3.3988E2	1.8882E1	
Total	23	1.9791E3		

R Square: 0.828
STD Error: 4.345

	COEFFICIENTS	T STATISTICS
CONST	-114.5415	-2.4469<.05
CRMC	-0.063	-1.2907 NS
UNEMP	1.0871	1.218 NS
M/C RATIO	125.7459	2.0566<.05
CWNJ	0.1053	2.3455<.05
WAGE INDEX	6.4174	1.6978<.10

Regression No. 2
x = CRMC and M/C Ratio and Wage Index and CWNJ and Draft
y = NAVRET

ANOVA

Source	DF	Sum Squares	Mean Square	F-Ratio
Regression	5	1.6247E3	3.2493E2	1.6499E1<<.01
Residual	18	3.5449E2	1.9694E1	
Total	23	1.9791E3		

R Square: 0.820
STD Error: 4.437

	COEFFICIENTS	T STATISTICS
CONST	-132.9598	-2.3782<.05
CRMC	-0.0985	-1.9763<.10
M/C RATIO	174.1895	2.8363<.01
WAGE INDEX	5.2834	1.4447 NS
CWNJ	0.1273	2.4491<.05
DRAFT	-3.274	-0.825 NS

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Regression No. 3
        x = CRMC and UNEMP and M/C Ratio and CWNJ and Draft
        Y = NAVRET

ANOVA

Source	DF	Sum Squares	Mean Square	F-Ratio
Regression	5	1.5868E3	3.1736E2	1.4560E1<< .01
Residual	18	3.9235E2	2.1797E1	
Total	23	1.9791E3		

R Square: 0.801
STD Error: 4.668

	COEFFICIENTS	T STATISTICS
CONST	-173.6248	-3.4177
CRMC	-0.1494	-4.1762
UNEMP	0.3943	0.3859
M/C RATIO	228.2171	4.4372
CWNJ	0.1761	4.3004
DRAFT	-1.4092	-0.3001

Regression No. 4
        x = CRMC and UNEMP and Wage Index and M/C Ratio and Draft
        y = NAVRET

ANOVA

Source	DF	Sum Squares	Mean Square	F-Ratio
Regression	5	1.5528E3	3.1056E2	1.3112E1<< .01
Residual	18	4.2632E2	2.3685E1	
Total	23	1.9791E3		

R Square: 0.784
STD Error: 4.866

	COEFFICIENTS	T STATISTICS
CONST	-9.8328	-0.5114 NS
CRMC	0.0336	1.0631 NS
UNEMP	1.5155	1.3979 NS
WAGE INDEX	12.0714	3.9478< .002
M/C RATIO	10.5198	0.2294 NS
DRAFT	3.5716	0.858 NS

Regression No. 5
        x = CRMC and UNEMP and Wage Index and CWNJ and Draft
        y = NAVRET

ANOVA

Source	DF	Sum Squares	Mean Square	F-Ratio
Regression	5	1.5714E3	3.1429E2	1.3876E1<< .01
Residual	18	4.0771E2	2.2650E1	
Total	23	1.9791E3		

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R Square: 0.793
STD Error: 4.759

	COEFFICIENTS	T STATISTICS
CONST	-41.9894	-1.0802 NS
CRMC	0.034	2.6346< .02
UNEMP	1.9889	2.1552< .05
WAGE INDEX	11.8219	4.2742< .002
CWNJ	0.0309	0.9365 NS
DRAFT	2.9778	0.729 NS

Regression No. 6

    x = CRMC and UNEMP and M/C Ratio and MWN and Wage Index
    y = NAVRET

ANOVA

Source	DF	Sum Squares	Mean Square	F-Ratio
Regression	5	1.5639E3	3.1278E2	1.3559E1<< .01
Residual	18	4.1524E2	2.3069E1	
Total	23	1.9791E3		

R Square: 0.790
STD Error: 4.802

	COEFFICIENTS	T STATISTICS
CONST	35.6915	0.7592 NS
CRMC	0.0683	1.4889 NS
UNEMP	1.0116	1.0173 NS
M/C RATIO	-27.7817	-0.4593 NS
MWN	-0.0464	-1.1119 NS
WAGE INDEX	15.4228	5.2712<< .002

Regression No. 7

    X = CRMC and Draft and CWNJ and M/C Ratio and Wage Index
    y = NAVRET

ANOVA

Source	DF	Sum Squares	Mean Square	F-Ratio
Regression	5	1.6247E3	3.2493E2	1.6499E1<< .01
Residual	18	3.5449E2	1.9694E1	
Total	23	1.9791E3		

	COEFFICIENTS	T STATISTICS
CONST	-132.9598	-2.3782< .05
CRMC	-0.0985	-1.9763< .10
DRAFT	-3.274	-0.825 NS
CWNJ	0.1273	2.4491< .05
M/C RATIO	174.1895	2.8363< .02
WAGE INDEX	5.2834	1.4447 NS

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Regression No. 8
          x = CRMC and UNEMP and CWNJ and MWN and Wage Index
          y = NAVRET

                              ANOVA

Source	DF	Sum Squares	Mean Square	F-Ratio
Regression	5	1.6679E3	3.3358E2	1.9291E1<<.01
Residual	18	3.1126E2	1.7292E1	
Total	23	1.9791E3		

R Square: 0.842
STD Error: 4.158

	COEFFICIENTS	T STATISTICS
CONST	-13.5238	-0.3777
CRMC	0.0368	3.2591<.01
UNEMP	1.1862	1.442 NS
CWNJ	0.0883	2.5089<.02
MWN	-0.0828	-2.5047<.02
WAGE INDEX	11.7962	6.3402<<.002

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significance at the .01 level. These very clear indications of progress made further refinement of the model worthwhile.

The decision was made to substitute into the regression the dummy variable for Draft/AVF and to remove one of the other predictors. The purpose of the substitution was two-fold. First, it would establish if the Draft dummy variable was a predictor with enough strength to be included in the final model. Secondly, the substitution would eliminate weak variables from the model.

The Draft variable was first substituted into the analysis in regression number two of Table VIII, replacing the Unemployment (UNEMP) variable. The regression results were not significantly changed.

Next, the unemployment variable was reintroduced and the Wage Index removed and replaced by the Draft dummy variable. The results are given in regression number three of Table VIII. The results of this change were not encouraging, with the statistical indicators (R^2, F, and standard error) all deteriorating, indicating that further refinement of the model was required.

Next, the Wage Index was reintroduced and the Draft dummy variable was substituted for the CWNJ variable in the regression. The results are contained in regression number four of Table VIII. The results again show deterioration, but the changes are small. The major change was in the significance levels of the predictor variables. The number of

predictors that were statistically significant decreased to one. This indicated again that continued refinement of the model was necessary.

The next test of a five variable model was with the removal of the M/C Ratio and the reintroduction of the CWNJ variable. The R^2 statistic in regression number five increased over those obtained in regression number four. However, the most important result was the strengthening of the t-statistic values of the predictor variables, and the decrease in the standard error of estimate. The number of statistically significant predictor variables was now three, and the possible candidates for exclusion were CWNJ, and M/C Ratio. All three of the significant predictor variables would have to be tested later in the model development to validate their usefulness as predictors of the Navy career retention behavior.

The next examination of the five predictor variable model, regression number six of Table VIII, was conducted with the dummy (Draft), and the Civilian Wages for Navy Jobs (CWNJ) variables being removed and replaced by the Military/ Civilian Pay Ratio (M/C Ratio) and Mean Wages Nationally by Region (MWN) variables. The results were not encouraging: (1) The number of statistically significant predictors decreased by two, (2) The F-ratio decreased, (3) The standard error increased, and (4) R^2 decreased. The deterioration of the model required the replacement of the variables that were removed if improvement was to be expected.

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Regression number seven of Table VIII shows the results of removing the Mean Wage Nationally by Region (MWN) and the Unemployment (UNEMP) variables and their replacment by the dummy (Draft) and Civilian Wages for Navy Jobs (CWNJ) variables. The results were encouraging and the statistical indicators showed improvement in the model, with all the indicators improving (R^2, F, Predictor t-statistics, and standard error).

The final test of the five variable model was made by removing the dummy (Draft) and Military/Civilian Pay Ratio (M/C Ratio) variables. The deleted variables were replaced by the Mean Wage Nationally by Region (MWN) and the Unemployment (UNEMP) variables. The results are contained in regression number eight of Table VIII. They are encouraging because the number of significant predictor variables increased from three to four. The R^2 increased from 0.8209 to 0.8427, with the F-ratio also rising.

The results of the five-variable model examinations indicated that there were three candidate predictor variables for exclusion from the final model development: (1) CWNJ, (2) MWN, and (3) the Draft dummy. The validity of the exclusion would have to be tested via a four variable model.

The four predictor variable models were tested and the results are contained in Table IX. The first of the four variable models was one containing the variables: (1) Career RMC (CRMC), (2) Unemployment (UNEMP), (3) Wage Index, and (4) Civilian Wages for Navy Jobs (CWNJ). The results of

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Table IX

The Four Variable Model of Navy Career Retention

Regression No. 1
        x = CRMC and UNEMP and Wage Index and CWNJ
        y = NAVRET, 1956-1979

ANOVA

Source	DF	Sum Squares	Mean Square	F-Ratio
Regression	4	1.5594E3	3.8985E2	1.7647E1 <<.01
Residual	19	4.1974E2	2.2092E1	
Total	23	1.9791E3		

R Square: 0.787
STD Error: 4.700

	COEFFICIENTS	T STATISTICS
CONST	-49.1287	-1.3224
CRMC	0.0344	2.7093< .02
UNEMP	1.8252	2.0648< .10
WAGE INDEX	13.1899	6.5729<<.002
CWNJ	0.0358	1.1198 NS

Regression No. 2
        x = CRMC and UNEMP and Wage Index and MWN
        y = NAVRET

ANNOVA

Source	DF	Sum Squares	Mean Square	F-Ratio
Regression	4	1.5590E3	3.8976E2	1.7628E1 <<.01
Residual	19	4.2011E2	2.2111E1	
Total	23	1.9791E3		

R Square: 0.787
STD Error: 4.702

	COEFFICIENTS	T STATISTICS
CONST	22.8644	0.6176
CRMC	0.0479	4.0869< .002
UNEMP	0.8602	0.9365 NS
WAGE INDEX	14.3615	8.1708<<.002
NWN	-0.0334	-1.112 NS

Regression No. 3
        x = CRMC and UNEMP and Wage Index and Draft
        y = NAVRET

ANNOVA

Source	DF	Sum Squares	Mean Square	F-Ratio
Regression	4	1.5516E3	3.8789E2	1.7237E1 <<.01
Residual	19	4.2757E2	2.2504E1	
Total	23	1.9791E3		

R Square: 0.783
STD Error: 4.743

	COEFFICIENTS	T STATISTICS
CONST	-10.1108	-0.5405
CRMC	0.0404	3.7098 < .002
UNEMP	1.6627	1.952 < .10
WAGE INDEX	12.3714	4.5919 < .002
DRAFT	3.7479	0.9398 NS

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this test are contained in regression number one of Table IX. The statistical indicators are encouraging because R^2 only decreased by 0.055, while the number of statistically significant predictors was three.

The next four variable model that was tested contained: (1) Career RMC, (2) Unemploymemt, (3) Wage Index, and (4) Mean Wages Nationally by Region. The results of the test of this variation of the four variable model are contained in regression number two of Table IX. The statistical tests revealed that this four variable model was not a strong candidate for selection as the final form of the predictive model.

The final four variable model tested contained the variables: (1) Career RMC, (2) Unemployment, (3) Wage Index, and, (4) Draft. The statistical results of the test of the model are contained in regression number three of Table IX. The number of statistically significant predictor variables was up from two to three. The F-ratio and R^2 decreased slightly.

Because of the fact that none of the four variable models contained predictors all of which were statistically significant, the decision was made to test a model with the three significant predictor variables from regression three of Table IX. The results of the analysis utilizing a three predictor variable model are contained in Table X. All three predictors are significant at the 0.10 level or below. Two of the predictor variables are significant at or below the 0.002 level: (1) CRMC, and (2) Wage Index.

Table X

Three Vairable Model Analysis

Regression No. 1
        x = CRMC and UNEMP and Wage Index
        y = NAVRET
                        ANOVA

Source	DR	Sum Squares	Mean Square	F-Ratio
Regression	3	1.5317E3	5.1057E2	2.2821E1 << .01
Residual	20	4.4744E2	2.2372E1	
Total	23	1.9791E3		

R Square: 0.773
STD Error: 4.729

	COEFFICIENTS	T STATISTICS
CONST	-12.9224	-0.7019
CRMC	0.0423	3.9739 <.002
UNEMP	1.3809	1.7371 <.10
WAGE INDEX	14.2789	8.0834 <.002

Regression No. 2
        x = CRMC and UNEMP and Wage Index
        y = NAVRET
                        ANOVA

Source	DR	Sum Squares	Mean Square	F-Ratio
Regression	3	1.4317E3	4.7724E2	2.1285E1 << .01
Residual	19	4.2600E2	2.2421E1	
Total	22	1.8577E3		

R Square: 0.770
STD Error: 4.735

	COEFFICIENTS	T STATISTICS
CONST	-16.6807	-0.886
CRMC	0.0448	4.0881 <.002
UNEMP	1.4911	1.8552 <.10
WAGE INDEX	14.1094	7.9407 <.002

DO YOU WANT TO FORECAST A VALUE FOR Y?

ENTER X VECTOR (3 VALUES) 1282.38 4.2 1.0

FORECAST OF Y VALUE: 61.15

VARIANCE OF FORECAST ERROR: 33.37

ACTUAL 1979 62.2

The most important characteristic of a predictive model is the ability to predict accurately career retention behavior. The interactive capabilities of the software, described in [37], permit the forecasting of new y values utilizing actual data input as a new x-vector. The results contained in regression number two of Table X show the results of truncating the data so that the model contains only the years 1956-1978, and 1979 data are excluded. The R^2 decreased by 0.003. The F-ratio is, however, 21.28 which is much larger than needed to be significant at the 0.01 level.

Utilizing actual 1979 data with the regression equation developed using data from 1956-1979, the three variable model, which contains: (1) Career RMC, (2) Unemployment Rate, and (3) Wage Index, predicted Navy career retention to be 61.2 percent. The actual Navy career retention for 1979 was 62.2 percent. The actual Navy career retention for 1979 was 62.2 percent, which means the value predicted by the three variable model was 98.39 percent of the actual 1979 career retention rate.

For a clear picture of the accuracy of the three variable model over the period 1956-1979   data in Table XI should be reviewed. These data show that the model never erred more than 9.45 percentage points from the actual career retention rate. In fact, for 1979 the model is 0.755 percentage points from the actual data.

Table XI

Predicted Career Retention vs Actual Career Retention

Year	Actual Career Retention	Predicted Career Retention	Error of the Prediction
1956	94.9	90.78	4.11
1957	85.8	87.12	-1.32
1958	89.0	98.45	-9.45
1959	90.1	92.62	-2.52
1960	90.9	89.41	1.48
1961	91.0	89.11	1.88
1962	92.2	85.60	6.59
1963	93.3	91.47	1.82
1964	90.1	89.98	0.11
1965	87.3	89.03	-1.73
1966	89.6	87.96	1.68
1967	80.9	86.17	-5.27
1968	79.4	84.86	-5.46
1969	78.4	82.62	-4.22
1970	83.7	80.99	2.70
1971	90.0	81.23	8.76
1972	91.0	84.81	6.18
1973	91.7	86.23	5.46
1974	80.3	81.69	-1.39
1975	80.5	80.26	0.23
1976	74.8	75.85	-1.05
1977	68.1	72.79	-4.69
1978	63.5	68.11	-4.61
1979	62.2	61.44	0.75

On the basis of the strength of the statistical indicators and the accuracy of the forecast value, the model appears to provide a useful predictor of Naval career retention. The model explains 77.39 percent of the variance in Navy career retention rates in the period 1956-1979, leaving 22.61 percent of the variance unexplained. The final form of the model is:

$$NAVRET = -12.9224 + 0.0423x_1 + 1.3809x_2 + 14.2789x_3$$

where

NAVRET = Career Retention Navy (E-5 through E-9) as the percentage of the Careerists eligible who reenlisted.

x_1 = Career Regular Military Compensation, E-5 to E-9

x_2 = Unemployment Rate Nationwide

x_3 = Index of All Services Less Rent (Wage Index) developed from, The Economic Report of the President, 1980[3].

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[3]The Wage Index is set to Base 1979 = 1.00 and it is in the form of a descending vs the more conventional inflating index. The purpose of this form of construction was to permit the investigator to deflate very quickly the value of recent pay to the real value. For example, using Wage Index data from Table III, it is possible to evaluate the present value of Basic pay for an E-7 in 1957 ($273.00) in constant 1979 dollars. Performing a simple multiplication of the basic pay of an E-7 in 1957, 273.00 x 3.341, the Wage Index for 1957, yields $912.10, the value of the E-7 Basic Pay of 1957 in constant 1979 dollars.
    The sign of the regression coefficient of the Wage Index variable appears to be counter intuitive. The sign of the coefficient is positive, but the effect of inflation is negative upon retention as shown in Table XII. The reason for this is that the sign of the change in the index from 1956 to 1979 is negative, and that makes the sign of the coefficient of the Wage Index variable positive in the final form of the model shown above.

B. VARIABLES FOUND TO HAVE INSIGNIFICANT RELATIONSHIPS WITH
   NAVY CAREERIST RETENTION RATES

1. End Strength of the Navy

The end strength of the Navy was included as a
variable in the analysis in several circumstances. The results
of the analysis to the magnitude of the multiple R statistic.
It was concluded upon the basis of this that end strength did
not help in predicting careerist retention rates.

2. Variations of the Unemployment Variable

a. Lag-unemployment rate

The lag-unemployment rate was found to have no
predictive strength in any combination where it was included;
consequently, it was deleted from consideration as a predictor
variable in the model development process.

b. Lead-unemployment

The lead-unemployment rate was found to have no
predictive strength in any combination where it was included;
consequently, it was deleted from consideration as a predictor
variable.

c. Changes in Unemployment

The change in employment rate from year to year,
when included in various combinations of other variables,
was observed to have a minimal effect on the R^2s and was not
included in the model development.

The conclusion, based upon the variation of the unemployment variable, was that careerists making a retention decision apparently use a very short time horizon with respect to unemployment conditions. The careerists would seem to use other variables as guides in their decision. Disaggregation of the data into occupations might yield different relationships, however.

3. <u>Other variables examined and found to have no relationship to career retention rates</u>:

   a. Mortgage Rates

   b. GNP

   c. Net National Income

V. POLICY IMPLICATIONS OF THE MODEL AS DEVELOPED

The development of a statistical model of career reenlistment rates permits the generation of data related to the policy aspects of the problem of low career reenlistment rates. The model can be used to answer questions about how career retention rates can be raised, and about the changes that might bring about an increase in career retention.

The most obvious change that can be made is in pay, specifically CRMC. Table XII contains data generated by the model developed in Chapter IV. The most interesting change indicated is if pay were increased by 12.5 percent from the CRMC of $1282 in 1979, the career retention rate would be predicted to increase 9.3 percent over the 62.2 percent of 1979 (1.093 x 62.2). Case three of Table XII shows the forecasted NAVRET with a 12.5 percent CRMC increase. The strength of the retention response to CRMC changes is less than one, with retention changing 3.3 percent for a five percent change in CRMC, as shown in Case one of Table XII. What this indicates is that at a point in time the wage elasticity of the careerists, as computed using data generated by the model for Case one in Table XII, is 0.66. This indicates that the price elasticity of the careerist is much less than the 1.25 estimated by Cooper (1977) [32] for new recruits.

The implication for the policy maker of the low wage elasticity is that the magnitude of the increases in pay, CRMC,

Table XII

Career Retention Forecast by the Model

Case	CRMC	UNEMP	Wage Index	Forecast NAVRET	Variance of Forecast
1.	1350	4.2	1.0	64.31	30.49
2.	1400	4.2	1.0	66.42	29.16
3.	1450	4.2	1.0	68.54	28.38
4.	1500	4.2	1.0	70.66	28.18
5.	1550	4.2	1.0	72.77	28.55
6.	1350	4.6	1.0	64.86	29.57
7.	1400	5.0	1.0	67.53	27.58
8.	1450	5.4	1.0	70.20	26.44
9.	1500	5.8	1.0	72.87	26.14
10.	1550	6.2	1.0	75.53	26.68
11.	1550	6.6	1.0	76.09	26.91
12.	1550	7.0	1.0	76.64	27.34
13.	1550	7.6	1.0	77.47	28.38
14.	1350	4.6	0.980	64.57	29.75
15.	1400	5.0	0.910	66.24	28.25
16.	1450	5.4	0.886	68.57	27.11
17.	1500	5.8	0.856	70.81	26.78
18.	1550	6.2	0.826	73.05	26.77
19.	1550	6.6	0.800	72.40	27.29
20.	1550	7.0	0.786	73.59	27.87
21.	1550	7.6	0.726	73.56	28.96

required to reverse the decrease of the career retention rate is very large, ceteris parabus. The careerist can be said, on the basis of the model, to be relatively wage inelastic [7]. Figure 3 shows the graph of the wage elasticity of the careerists based upon data from Table XII; it shows the elasticity function to be curvilinear and increasing in elasticity as the wages, CRMC, increase.

The implication of the increasing wage elasticity is that the careerists will be retained in accelerating numbers as wages are increased beyond a certain point. It would appear to be appropriate to raise the pay of the careerists sufficiently, and maintain that relative position, in order to achieve the increasing career retention.

The world in which we live, however, is very dynamic, and never is there an opportunity to change a single variable and hold all others constant. Consequently, it is appropriate that the model be utilized to observe changes predicted to occur with simultaneous manipulation of several of the variables. In Table XII, Case number 2-13, the values of two variables are changed, CRMC and UNEMP. The results indicate the magnitude of the quantity response, career retention rate change, to a change in prive, CRMC, is much larger than is the case in the single variable manipulation.

The change in career retention, with the unemployment rate rising to 7.6 percent and CRMC being increased by 17.3 percent, is 18.2 percent vs 14.5 percent as shown in Table XIII.

Percentage
Change in
Career
Retention

0   Percentage Change
           in Wages
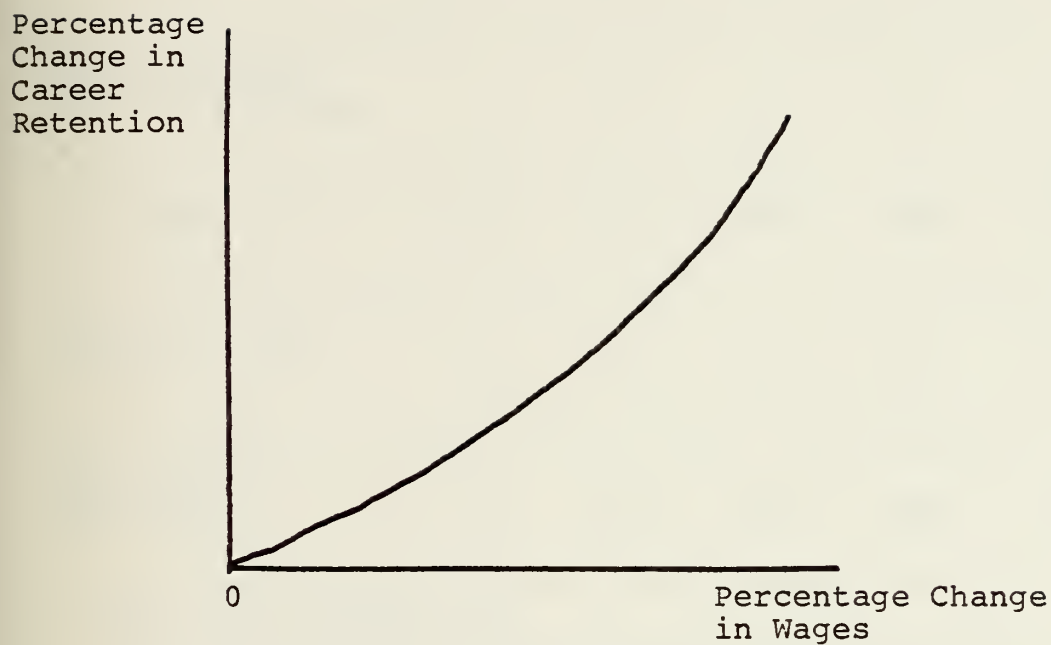
1. Graph dipicts data generated from Cases 1-5
    Table XII.

2. The data for the figure are contained in Table XIII.

3. An accurate graphic map of the wage elasticity of
    the careerists would require plotting the data from
    a continuous function over the range of the data.

FIGURE 3. Wage Elasticity and Retention

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Table XIII

Wage Elasticity

Case Nos. from Table XII	1	2	3	4	5
Career Retention from Table XI	64.3	66.4	68.5	70.7	72.7
Percentage Change in Career Retention	3.3	6.4	9.2	12.1	14.5
Pay (CRMC)	1350	1400	1450	1500	1550
Percentage Change in Pay	5.1	8.5	11.6	14.6	17.3
Resulting Wage Elasticity	.647	.753	.793	.828	.838

1. Data Taken from Table XII

2. Methodology of elasticity computation taken from Peterson [7]

3. Case 1 percentage changes are from 1979 data: (1) CRMC = 1282, and (2) Career retention rate of 62.2.

This indicates the wage elasticity of 1.05[4] for careerists in times of relatively high unemployment. The policy implication of this situation is that in periods of high unemployment, the magnitude of the pay increases necessary to achieve a given career retention response is smaller. The careerist becomes more wage elastic when faced with high unemployment rates in the civilian economy, ceteris parabus.

It is also appropriate to manipulate the three variables in the model and observe the resulting changes in career retention. The variables are manipulated by the same amount in each examination of the model's predictions.

Cases 14-21 in Table XII show the responses to continued inflation in the Wage Index. The Wage Index changes range from two percent to 27.4 percent, representing a wide range of possible career retention responses. The changes in the career retention rates are very much dampened by the effects of continued inflation of the Wage Index.

The implication of Wage Index inflation is that unless the problems of inflation are controlled, the magnitude of pay changes and levels of unemployment necessary to achieve an improving career retention rate will be high. The problem of inflation, based upon the model predictions, is depressing

_____

[4]The wage elasticity of 1.05 was obtained by taking the percentage change in career retention, 18.2, and dividing it by the percentage change in CRMC, 17.3. The result is 1.05 or the wage elasticity under the conditions of 7.6 percent unemployment and a pay raise of 14.5 percent.

because changes in inflation distort the effects of changes in
the other variables. From a policy standpoint, the single
variable that would be the most desirable to control is
inflation. The absence of control over inflation will distort
and possibly defeat, efforts to improve the career retention
rate.

VI.   CONCLUSIONS

The Navy in the period of the All-Volunteer Force, as shown in Table III, has suffered a 29.5 percentage point decrease in career retention (from 91.7 percent to 62.2 percent) in the seven years 1973-1979. The All-Volunteer Force changed the rules to the game, and the career personnel in the Navy adopted the new rules readily. The three predictor variable model developed in Chapter IV attempts to explain how the careerists are responding to the economic factors of their employment by the Navy. The model utilizes: (1) Career Regular Military Compensation, which is the total value of compensation (ignoring tax advantage and retirement accrual) received by the service man, (2) Unemployment Rate, which is the nationwide rate of unemployment as computed by the Bureau of Labor Statistics, and (3) The Index of All Services Less Rent, which is taken from The Economic Report of the President, 1980.

The model is very accurate in its fit to the career retention rates for 1956-1979, and may be useful for forecasting career retention in the future.

Additional areas of the Navy career retention question that should be examined are: (1) East Coast versus West Coast retention rates, (2) Surface versus Air versus Submarine retention rates, (3) Sea versus Shore assignment retention,

(4) Retention by rating, (5) Retention by rating and paygrade, and (6) Retention by paygrade. The examination of the career retention problem by utilizing data from each coast would reveal if retention is dependent upon the coast assignment.

The examination of the career retention data by warfare speciality would permit an understanding of the performance of the groups with respect to the careerists. It is an intriguing question whether career submariners are retained in higher percentages than are surface ship or naval air sailors. The comparisons would permit the development of a surrogate measure of the conditions of work in the three warfare areas.

The sea versus shore examination would explain if sea duty makes a difference in career retention, and whether compensation changes are required. Several studies [41] have indicated that _first term_ attrition rates are higher for personnel assigned to shore duty.

The possibility for development of a statistical model of career retention behavior for: (1) DOD, (2) Army, (3) Air Force, and (4) Marine Corps, is very much open. The data are contained in the appendices of this thesis. It would be of great benefit if this research were accomplished because it would permit a better understanding of the total force aspect of the careerist retention problem.

Overall, the areas explored by this thesis have only been lightly examined. All of the data and analyses reported here deserve replication and extension.

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APPENDIX A

TABLES OF BASIC PAY, SEA PAY AND BASIC
ALLOWANCE FOR QUARTERS IN CONSTANT 1979 DOLLARS

A-1   BASIC PAY TABLE

Source: Navy Accounting and Finance Office;
          Economic Report of President 1980: Index of
          all services less rent.

A-2   SEA PAY TABLE

Source: Navy Accounting and Finance Office;
          Economic Report of President 1980: Index of
          all services less rent.

A-3   BASIC ALLOWANCE FOR QUARTERS TABLE

Source: Navy Accounting and Finance Office
          Economic Report of the President 1980: Index
          of homeownership, rental costs and rent.

YEAR	0-6 20 YRS	0-5 16 YRS	0-4 12 YRS	0-3 6 YRS	0-2 3 YRS	0-1 0 YRS	W-4 20 YRS	W-3 18 YRS	W-2 16 YRS	W-1 12 YRS	E-9 18 YRS	E-8 16 YRS	E-7 12 YRS	E-6 8 YRS	E-5 6 YRS	E-5 3 YRS	E-1-1 0 YRS
1945	2443.50	1979.67	1629.00	1194.50	950.25	814.50	1764.75	1411.80	1400.00	1018.40			899.21	711.87	573.41	444.72	358.38
1946	2359.80	1911.85	1573.20	1153.68	917.70	786.60	1704.30	1363.44	1147.13	983.25			868.67	687.49	553.77	429.48	346.10
1947	2249.10	1822.17	1499.40	1099.65	874.65	749.70	1624.35	1299.48	1093.48	937.13			810.67	655.24	527.79	409.33	329.87
1948	2123.55	1720.45	1415.70	1038.18	825.83	707.05	1533.68	1226.94	1028.74	884.81			772.03	618.66	503.05	386.47	311.45
1949	2753.70	2241.38	1921.19	1536.95	1184.75	960.59	1961.63	1569.31	1307.75	1078.70			1056.99	858.80	726.68	594.56	429.40
1950	2679.56	2177.75	1869.46	1495.57	1152.05	934.73	1908.82	1527.05	1272.54	1049.65			1028.53	835.68	707.11	578.54	417.84
1951	2530.05	2059.34	1765.15	1412.12	1088.53	882.57	1802.31	1441.85	1201.54	991.09			971.14	789.05	667.66	546.27	394.52
1952	2625.58	2158.81	1867.08	1400.31	1080.63	876.18	1787.24	1429.80	1191.49	982.99			963.03	782.44	662.09	541.69	391.22
1953	2520.22	2072.18	1792.15	1344.11	1037.07	841.02	1715.51	1372.42	1143.67	943.54			924.38	751.04	635.51	519.95	375.52
1954	2448.86	2013.50	1741.40	1306.06	1007.70	817.20	1666.94	1333.56	1111.29	916.82			898.26	729.77	617.52	505.23	364.89
1955	2686.07	2184.76	1792.63	1456.51	1204.42	798.28	1792.63	1456.51	1284.06	1098.13			980.34	798.28	685.88	574.20	356.84
1956	2615.56	2125.14	1743.71	1416.76	1171.55	776.49	1743.71	1416.76	1249.79	1068.16			953.59	776.49	667.16	558.53	347.10
1957	2500.67	2036.66	1667.83	1355.11	1120.57	742.70	1667.83	1355.11	1195.41	1021.80			912.10	742.70	638.13	534.23	331.99
1958	2756.10	2307.60	1762.70	1473.30	1153.80	712.47	1685.83	1461.48	1259.57	1105.73	1346.10	1121.75	961.50	778.02	673.05	512.80	318.48
1959	2666.00	2232.00	1705.00	1426.00	1116.00	689.13	1630.60	1413.60	1218.30	1069.50	1302.00	1085.00	930.00	753.30	651.00	496.00	308.05
1960	2571.40	2152.80	1644.50	1375.40	1076.40	664.68	1572.74	1363.44	1175.07	1031.55	1255.80	1036.50	897.00	726.57	627.90	478.40	297.12
1961	2503.40	2100.96	1604.90	1342.28	1050.40	648.67	1534.87	1330.61	1146.77	1006.71	1255.56	1021.30	875.40	709.07	612.78	466.88	289.96
1962	2463.90	2062.80	1575.75	1317.90	1031.40	636.09	1506.99	1306.44	1125.95	988.43	1203.30	1002.75	859.50	696.20	601.65	456.40	284.70
1963	2650.72	2201.93	1851.30	1520.73	1262.25	623.55	1725.08	1458.60	1276.28	1093.95	1332.74	1136.03	939.68	785.40	687.23	532.95	278.73
1964	2659.08	2208.63	1856.99	1533.36	1266.54	662.10	1730.17	1463.36	1280.54	1097.73	1336.54	1139.72	942.91	788.09	689.27	534.45	272.77
1965	2747.98	2282.36	1918.69	1584.73	1308.56	788.35	1787.84	1512.48	1323.01	1293.31	1376.56	1173.85	971.14	811.68	709.90	550.45	280.94
1966	2722.00	2261.23	1900.55	1569.92	1296.32	780.72	1768.50	1508.52	1311.17	1123.68	1433.50	1221.56	1011.16	844.69	739.10	572.63	312.90
1967	2741.17	2276.10	1913.15	1580.34	1304.83	786.13	1783.12	1508.34	1319.52	1131.44	1442.95	1229.89	1017.56	850.05	744.25	576.74	315.18
1968	2763.68	2295.22	1929.31	1593.21	1316.01	792.79	1797.64	1521.14	1330.56	1140.68	1515.59	1266.34	1102.56	857.46	750.29	581.43	318.09
1969	2898.74	2407.44	2023.96	1671.46	1380.29	811.53	1885.79	1595.92	1395.17	1196.30	1526.84	1301.53	1076.86	899.32	786.99	610.92	333.78
1970	2881.02	2393.21	2012.05	1661.76	1372.04	826.43	1860.89	1586.37	1387.48	1189.18	1518.10	1293.67	1070.44	894.11	782.50	606.76	331.88
1971	2941.10	2442.40	2053.77	1596.03	1400.63	843.52	1913.37	1619.10	1416.36	1213.62	1549.45	1320.32	1092.31	912.60	798.60	619.45	338.65
1972	3035.47	2520.82	2119.69	1750.46	1445.56	956.32	1974.81	1670.99	1461.78	1252.57	1599.10	1366.46	1127.15	941.73	824.42	661.88	601.15
1973	3295.63	2736.60	2284.48	1899.70	1569.32	1036.20	2143.38	1813.35	1586.94	1360.01	1736.15	1479.69	1223.23	1022.73	894.76	757.46	652.29
1974	3159.34	2623.68	2205.70	1821.61	1504.35	995.06	2054.61	1738.77	1521.30	1303.84	1664.39	1418.69	1172.51	980.46	857.61	726.29	617.24
1975	3002.45	2493.38	2095.92	1731.26	1429.66	945.72	1952.36	1652.45	1445.84	1239.23	1581.74	1348.29	1114.41	931.66	814.94	690.12	593.84
1976	2868.86	2385.36	2005.04	1656.19	1367.50	904.59	1866.85	1580.67	1383.24	1185.41	1513.03	1293.43	1072.79	891.22	779.52	660.35	567.93
1977	2827.06	2347.75	1973.40	1630.04	1346.10	890.47	1838.18	1555.69	1361.40	1166.76	1489.35	1269.55	1049.38	876.99	767.27	649.90	559.14
1978	2739.56	2274.97	1912.38	1579.59	1304.38	862.78	1781.14	1507.60	1319.11	1130.62	1443.32	1230.39	1016.79	849.72	743.59	629.76	541.71
1979	2627.10	2101.60	1833.90	1514.70	1250.70	827.40	1707.90	1445.70	1265.10	1084.20	1384.20	1179.90	975.00	814.80	713.10	603.90	519.60

Table A-1. Basic Pay Table

YEAR	E-3 0 YRS	E-4 3 YRS	E-5 6 YRS	E-6 8 YRS	E-7 12 YRS	E-8 16 YRS	E-9 18 YRS	W-1	W-2	W-3	W-4	O-1	O-2	O-3	O-4	O-5	O-6
1945	71.68	88.94	114.68	142.37	179.84			101.84	140.00	141.18	176.48	81.45	95.02	119.45	162.90	197.96	244.35
1946	69.22	85.90	110.75	137.50	173.68			98.32	114.73	136.34	170.43	78.66	91.77	115.37	157.32	191.19	235.98
1947	65.97	81.86	105.56	131.05	163.73			93.71	109.33	129.95	162.43	74.97	87.46	109.96	149.94	182.22	224.91
1948	62.29	77.29	100.61	123.73	154.11			88.48	102.87	122.69	153.37	70.79	82.58	103.82	141.57	172.02	212.35
1949	38.20	58.42	71.90	89.88	101.12												
1950	37.17	56.85	69.97	87.46	98.39												
1951	35.10	53.67	66.06	82.58	92.90												
1952	33.46	51.18	62.99	78.74	88.58												
1953	32.12	49.13	60.46	75.58	85.03												
1954	31.21	47.74	58.75	73.44	82.62												
1955	30.52	46.68	57.46	71.82	80.79												
1956	29.69	45.41	55.89	69.86	78.59												
1957	28.40	43.43	53.46	66.82	75.17	72.11											
1958	27.24	41.67	51.26	64.10	72.11	69.75	72.11										
1959	26.35	40.30	49.60	62.00	69.75	67.28	69.75										
1960	25.42	38.87	47.84	59.80	67.28	65.66	67.28										
1961	24.80	37.93	46.69	58.36	65.66	64.46	65.66										
1962	24.15	37.25	45.84	57.30	64.46	63.11	64.46										
1963	23.84	36.47	44.88	56.10	63.11	61.76	63.11										
1964	23.33	35.69	43.92	54.90	61.76	60.21	61.76										
1965	22.75	34.79	42.82	53.52	60.21	57.80	60.21										
1966	21.84	33.40	41.10	51.33	57.80	55.10	57.80										
1967	20.82	31.84	39.18	48.98	55.10	52.11	55.10										
1968	19.68	30.11	37.06	46.32	52.11	48.42	52.11										
1969	18.29	27.98	34.43	43.04	48.42	44.53	48.42										
1970	16.82	25.72	31.66	39.58	44.53	42.12	44.53										
1971	16.32	24.34	29.95	37.44	42.12	40.55	42.12										
1972	15.30	23.43	28.83	36.04	40.55	38.86	40.55										
1973	14.80	22.45	27.63	34.54	38.86	35.30	38.86										
1974	13.34	20.40	25.10	31.38	35.30	31.96	35.30										
1975	12.07	18.46	22.72	28.40	31.96	29.49	31.96										
1976	11.14	17.04	20.97	26.22	29.49	27.34	29.49										
1977	10.33	15.79	19.44	24.30	27.34	25.11	27.34										
1978	9.49	14.51	17.86	22.32	25.11	22.50	25.11										
1979	8.50	13.00	16.00	20.00	22.50		22.50										

Table A-2. Sea Pay Table

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YEAR	O-6	O-5	O-4	O-3	O-2	O-1	W-4	W-3	W-2	W-1	E-9	E-8	E-7	E-6	E-5	E-4	E-3-1
1945	494.76	494.76	432.92	371.07	309.23	247.38	432.92	371.07	309.23	247.38	•						
1946	493.08	493.08	431.45	369.81	308.18	246.54	431.45	369.81	308.18	246.54	•						
1947	409.72	489.72	428.51	367.29	306.00	244.86	428.50	367.29	306.00	244.86	•						
1948	474.48	474.48	415.17	355.86	296.55	237.24	415.17	355.86	296.55	237.24	•						
1949	445.32	445.32	389.65	331.99	306.16	278.32	389.65	333.99	306.16	278.32			315.44	315.44	250.49	250.49	166.99
1950	426.36	426.36	373.07	319.77	293.12	266.48	373.07	319.77	293.12	266.48			302.00	302.00	239.82	239.82	159.89
1951	411.86	411.86	360.36	308.88	283.14	257.40	360.36	308.88	283.14	257.40			291.72	291.72	231.66	231.66	154.44
1952	451.58	451.58	395.13	338.69	310.95	282.24	395.13	338.69	310.95	282.24			319.87	319.87	254.50	254.50	169.30
1953	433.79	433.79	379.57	325.35	298.71	271.12	379.57	325.35	298.71	271.12			307.27	307.27	244.48	244.48	162.67
1954	425.58	425.58	372.39	319.19	293.06	265.99	372.39	319.19	293.06	265.99			301.46	301.46	239.86	239.86	159.59
1955	414.36	414.36	362.57	310.78	285.33	258.98	362.57	310.78	285.33	258.98			293.51	293.51	233.54	233.54	155.39
1956	409.85	409.85	358.62	307.39	282.22	256.16	358.62	307.39	282.22	256.16			290.31	290.31	230.99	230.99	154.69
1957	402.47	402.47	352.16	301.85	277.14	251.54	352.16	301.85	277.14	251.54			285.08	285.08	226.82	226.82	150.93
1958	390.70	390.70	341.86	293.02	269.04	244.19	341.86	293.02	269.04	244.19	276.74	276.74	276.74	276.74	220.19	220.19	146.51
1959	382.49	382.49	334.68	286.87	263.38	239.06	334.68	286.87	263.38	239.06	270.91	270.93	270.93	270.93	215.57	215.57	143.44
1960	378.11	378.11	330.85	283.59	260.37	236.32	330.85	283.59	260.37	236.32	267.83	267.83	267.83	267.83	213.10	213.10	141.79
1961	371.41	371.41	324.98	278.56	255.75	232.13	324.98	278.56	255.75	232.13	263.08	263.08	263.08	263.08	209.33	209.33	139.28
1962	367.58	367.58	321.63	275.69	253.12	229.74	321.63	275.69	253.12	229.74	260.37	260.37	260.37	260.37	207.17	207.17	137.04
1963	447.36	414.23	381.40	342.03	315.60	289.56	381.40	342.03	315.60	289.56	315.60	315.60	302.18	289.56	276.15	276.15	218.55
1964	446.68	413.60	380.90	341.51	315.12	289.12	380.90	341.51	315.12	289.12	315.12	315.12	301.73	289.13	275.73	275.73	218.22
1965	440.22	407.61	375.39	336.57	310.56	284.94	375.39	336.57	310.56	284.94	310.56	310.56	297.36	284.94	271.74	271.74	215.06
1966	433.58	401.46	369.73	331.50	305.88	280.65	369.73	331.50	305.88	280.65	305.88	305.88	292.88	280.65	267.65	267.65	211.83
1967	422.53	391.23	360.30	323.04	298.08	273.49	360.30	323.04	298.08	273.49	298.08	298.08	285.41	273.49	260.82	260.82	225.05
1968	410.96	380.52	350.44	314.20	289.92	266.00	350.44	314.20	289.92	266.00	289.20	289.20	265.42	266.00	253.68	253.68	218.88
1969	378.98	350.91	323.17	289.75	267.36	245.30	323.17	289.75	267.36	245.30	267.36	267.36	255.99	245.30	233.94	233.94	201.85
1970	355.83	329.69	303.44	272.48	251.04	230.31	303.44	272.48	251.04	230.33	251.04	251.04	240.37	230.33	219.66	219.66	189.54
1971	339.50	313.43	288.65	258.80	238.80	219.10	288.65	258.80	238.80	219.10	238.80	238.80	228.65	219.10	208.95	208.95	180.29
1972	493.61	456.35	411.63	373.79	335.95	255.16	397.30	366.34	331.94	307.29	352.01	329.08	308.44	286.65	264.86	232.19	200.66
1973	468.81	433.42	409.10	336.86	319.08	257.00	431.79	347.93	315.26	297.30	334.32	312.54	292.94	272.25	251.56	220.52	190.53
1974	434.95	401.94	362.70	329.21	295.71	238.29	349.78	322.51	292.33	270.83	310.07	288.97	271.79	254.65	233.51	201.32	176.57
1975	412.70	381.55	344.35	312.34	280.76	226.28	332.24	303.45	277.36	256.96	294.17	275.13	257.83	239.64	220.63	193.83	167.42
1976	431.61	411.97	361.94	326.43	291.71	234.43	349.10	310.17	287.29	265.10	307.47	285.68	266.71	246.14	226.37	198.93	172.70
1977	458.69	417.55	372.72	334.93	298.25	239.34	359.02	326.78	293.07	269.72	315.66	291.95	271.58	249.72	229.34	201.92	175.99
1978	442.73	403.07	359.68	323.41	287.81	231.20	346.46	315.61	282.07	260.35	304.76	281.71	262.05	241.03	221.37	194.93	169.84
1979	410.40	381.60	340.50	306.30	272.70	219.00	328.20	298.80	268.20	246.60	288.60	266.70	248.10	228.30	209.70	184.50	160.80

Table A-3. Basic Allowance for Quarters Table

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APPENDIX B

MANUFACTURING WAGES BY AREAS OF NATION

TABLE B-1   MANUFACTURING WAGES BY AREAS OF NATION

Source: Employment and Earnings, United States
1909-1978, June 1980 Bulletin 1312-11
U.S. Department of Labor, Bureau of
Labor Statistics, and Occupational
Conversion Manual, December 1977 Defense
Manpower Data Center.

	AREAS											Com- posite Mean	Mean Monthly Const $	E-5-9 RW Mean 579
	1	2	3	4	5	6	7	8	9	10	11			
1956	92.31	89.90	92.12	86.67		67.47	60.95	66.26		66.00	83.22	78.34	1185.85	1137.73
1957	93.75	93.42	95.67	89.39		71.20	64.96	70.24		67.25	84.77	81.18	1175.35	1096.12
1958	104.58	96.80	99.84	93.90		72.13	66.80	70.84	82.11	69.25	85.41	84.17	1168.92	1328.06
1959	106.11	101.66	105.59	97.52		77.99	70.68	74.74	88.70	74.07	92.00	88.93	1194.57	1268.28
1960	110.57	103.34	109.37	101.53		80.60	72.00	76.57	90.52	73.68	93.53	91.17	1181.27	1229.37
1961	114.33	107.74	113.78	107.56		83.82	72.25	79.30	94.70	76.59	97.02	94.61	1196.29	1207.58
1962	118.40	110.03	117.90	111.81		83.58	78.79	83.23	98.49	80.60	100.65	98.35	1221.03	1181.71
1963	122.49	113.93	122.85	114.44		85.97	80.80	86.11	102.11	82.62	102.80	101.41	1202.34	1334.10
1964	126.86	116.76	126.01	119.59		89.82	81.00	89.69	105.56	84.61	105.73	104.58	1244.01	1335.42
1965	131.87	121.99	132.00	124.74		93.48	86.53	93.91	108.92	88.73	111.93	109.41	1260.72	1359.05
1966	137.76	127.00	136.80	134.67		100.50	92.92	99.82	120.13	93.25	117.96	116.08	1292.25	1392.55
1967	146.47	131.78	140.30	138.75	94.53	105.66	97.82	100.43	122.60	96.45	119.80	118.05	1252.82	1390.81
1968	150.66	136.82	150.08	146.00	111.64	107.20	111.22	111.30	128.65	102.91	126.63	125.76	1352.54	1411.29
1969	158.36	142.51	159.61	159.59	120.78	118.66	114.81	113.70	135.14	108.94	136.49	133.47	1244.65	1416.85
1970	164.80	145.30	165.33	167.20	126.90	127.82	122.91	119.94	140.94	112.68	140.51	139.49	1196.24	1391.22
1971	167.03	153.64	178.48	171.78	132.53	140.44	126.67	126.38	146.14	118.29	150.86	146.56	1188.89	1400.26
1972	172.38	161.19	194.82	185.26	127.83	159.38	128.96	139.07	157.35	125.92	160.39	155.69	1215.71	1517.28
1973	184.06	171.70	208.92	197.60	155.85	163.66	142.80	137.20	168.92	132.38	171.63	167.80	1255.03	1599.98
1974	190.22	177.41	222.83	209.75	159.57	181.79	151.78	145.25	171.97	143.78	183.60	176.18	1197.84	1523.05
1975	201.55	200.20	252.31	235.22	185.96	208.15	168.09	165.62	194.97	151.32	205.93	197.21	1212.64	1415.05
1976	216.93	213.07	274.72	256.11	200.93	205.02	181.30	169.34	213.72	167.96	223.08	211.16	1206.92	1403.60
1977	235.77	230.68	298.05	263.59	224.59	223.13	204.35	223.65	234.60	176.40	221.51	230.85	1215.42	1386.71
1978	248.29	248.47	318.00	310.86	246.46	247.94	222.32	239.62	263.08	190.79	269.06	254.99	1233.13	1342.05
1979	266.73	270.14	342.68	335.86	284.38	257.90	234.20	257.90	279.47	201.89	286.22	274.27	1188.50	1282.38

AREAS:
1 - San Diego
2 - LA-LBeach
3 - San Fran
4 - Bremerton
5 - Honolulu
6 - Jacksonville
7 - Charleston, SC
8 - Norfolk
9 - New London (New Haven)
10 - Newport, RI
11 - Philadelphia (SMSA)

Table B-1 Manufacturing Wages By Areas of Nation.

RATIO OF MILITARY TO CIVILIAN WAGES REGIONALLY

YEARS	FRINGE %	MEAN OF FRINGE AND WEEKLY WAGE	INDEX OF WAGES	CONSTANT 1979 $ WEEKLY WAGES	CONSTANT 1979 $ MONTLY WAGES	RMC/CIV
1956	.067	78.34	3.493	291.98	1265.23	.8992
1957	.072	81.18	3.341	290.75	1259.92	.8699
1958	.074	84.17	3.205	289.73	1255.49	1.0578
1959	.079	88.93	3.100	297.46	1289.00	.9839
1960	.084	91.17	2.990	295.50	1280.49	.9601
1961	.086	94.61	2.918	299.81	1299.20	.9295
1962	.091	98.35	2.865	307.41	1332.13	.8871
1963	.094	101.41	2.805	311.19	1348.50	.9893
1964	.095	104.58	2.745	314.34	1362.16	.9804
1965	.095	109.41	2.676	320.60	1389.25	.9783
1966	.103	116.08	2.569	328.93	1425.34	.9770
1967	.104	118.05	2.449	319.17	1383.08	1.0056
1968	.107	125.76	2.316	322.42	1397.18	1.0101
1969	.110	133.47	2.152	318.82	1381.56	1.0255
1970	.115	139.49	1.979	307.80	1333.79	1.0431
1971	.121	146.56	1.872	307.56	1332.75	1.0506
1972	.128	155.69	1.802	316.46	1371.35	1.1064
1973	.140	167.80	1.727	330.36	1431.57	1.1176
1974	.146	176.18	1.569	316.78	1372.73	1.1095
1975	.155	192.21	1.420	315.24	1366.06	1.0578
1976	.166	211.16	1.311	308.94	1338.75	1.0484
1977	.176	230.85	1.215	329.85	1429.34	.9702
1978	.182	254.99	1.116	336.36	1457.56	.9208
1979	.189	274.27	1.000	326.11	1413.13	.9075

Fringe benefits included to make the civilian wages reflect some of the non-paycheck benefits as RMC does.

Source: Index of All Services less Rent, Economic Report of the President 1980.

APPENDIX D

CAREER RENTION OF THE U.S. MILITARY

	ARMY	NAVY	USMC	USAF	DOD
1956	88.8	94.9	82.1	87.9	89.7
1957	83.2	85.8	83.1	91.4	85.8
1958	80.4	89.0	82.5	91.8	85.2
1959	83.9	90.1	76.5	92.9	87.4
1960	83.2	90.9	67.4	86.2	84.6
1961	87.3	91.0	78.7	88.8	88.2
1962	86.8	92.2	83.1	89.5	88.8
1963	89.2	93.3	84.6	85.4	88.3
1964	84.4	90.1	85.7	89.9	87.5
1965	84.1	87.3	84.5	89.3	87.2
1966	83.4	89.6	88.6	89.7	87.7
1967	74.2	80.9	77.9	88.0	81.1
1968	67.6	79.4	76.0	87.7	78.8
1969	64.5	78.4	74.5	86.0	77.9
1970	62.6	83.7	78.0	86.5	76.6
1971	64.6	90.0	81.8	90.9	78.2
1972	45.7	91.0	82.6	94.4	73.8
1973	63.0	91.7	81.7	92.7	82.6
1974	74.5	80.3	79.6	89.8	81.4
1975	75.4	80.5	73.1	89.6	81.5
1976	70.8	74.8	77.6	81.9	76.3
1977	69.5	68.1	71.6	86.2	74.8
1978	68.6	63.5	69.1	82.2	71.5
1979	66.4	62.2	51.9	81.5	68.2
1980	70.6	68.2	51.2	81.7	71.4

Source: Office of the Deputy Assistant Secretary of Defense for Military
        Personnel Policy; The Director of Enlisted Personnel Management.

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NAVY JOBS CONVERTED TO CIVILIAN OCCUPATIONS: WAGE RATES IN STABILIZED 1979 DOLLARS AND UNSTABILIZED

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Mean of Pay	Mean Pay in Constant 79 $
1956	341.38	412.96	411.08	414.14	419.56	341.30	380.21			417.65	250.50	284.61		392.77		370.65	1294.68
1957	353.56	430.56	411.90	417.52	435.98	353.56	380.13			434.50	255.10	289.60		401.44		378.55	1244.74
1958	350.41	470.77	406.40	438.75	430.71	358.41	379.41			449.71	258.30	292.63		410.02	436.36	391.49	1252.73
1959	382.46	492.39	444.45	462.06	432.65	382.46	417.60			469.77	265.20	303.05	417.43	432.12	454.48	415.91	1289.32
1960	388.78	516.01	450.28	478.53	499.24	388.78	432.12			488.24	285.12	315.21	444.38	445.93	478.40	432.08	1291.92
1961	400.14	535.64	463.42	496.94	496.99	400.14	433.53			511.60	288.10	325.61	451.40	455.22	472.59	462.21	1346.73
1962	418.42	551.52	488.30	519.07	553.24	418.42	462.67			530.70	297.60	334.18	470.51	468.04	493.11	462.21	1324.23
1963	431.73	574.32	499.39	530.53	574.45	431.73	475.45			551.16	301.20	350.74	508.34	479.66	513.05	478.62	1342.53
1964	446.20	587.21	521.49	541.79	590.13	446.20	497.73			572.26	301.46	365.64	537.42	495.52	529.92	495.11	1360.45
1965	465.96	617.99	547.82	571.48	635.73	465.56	520.95			599.65	316.93	371.75	565.41	511.85	545.51	518.68	1387.93
1966	480.65	645.52	585.35	621.05	637.95	486.65	551.03			631.79	333.84	385.20	589.58	531.31	548.12	539.47	1405.50
1967	496.12	658.02	589.12	636.97	627.61	496.12	552.91			671.45	348.11	399.23	582.27	535.78	566.45	551.57	1450.79
1968	530.87	675.72	605.45	658.84	728.39	510.87	581.66			712.79	348.35	414.79	619.49	577.54	588.20	562.48	1449.02
1969	561.21	715.52	651.28	699.18	739.09	561.21	621.70			786.67	392.47	410.92	657.49	612.45	615.11	621.10	1336.61
1970	577.76	800.35	667.59	726.60	736.97	577.76	639.87			846.95	410.86	471.03	690.69	640.38	648.95	643.76	1283.90
1971	617.24	856.51	679.29	746.93	842.66	617.24	657.97			917.24	446.59	488.24	784.24	642.50	689.95	694.35	1299.62
1972	670.41	921.78	759.22	800.80	955.89	670.11	738.88	693.07	609.12	958.49	451.23	510.69	882.39	736.80	748.50	740.66	1334.67
1973	721.33	978.84	810.98	875.77	1029.21	721.33	804.96	724.84	624.14	1022.19	470.38	532.91	954.59	776.01	773.15	788.05	1361.41
1974	766.13	1029.77	847.54	955.89	1032.89	766.13	840.84	756.31	546.17	1080.08	505.14	554.87	997.14	817.39	809.47	821.31	1286.04
1975	826.76	1102.18	876.59	1073.80	1124.63	826.76	884.95	828.66	652.21	1153.01	551.41	596.31	1045.20	860.25	839.80	882.63	1253.62
1976	907.65	1217.36	971.53	1141.40	1318.02	907.05	976.56	920.62	750.23	1229.49	591.28	642.16	1135.51	927.89	895.53	968.02	1270.12
1977	991.50	1291.20	1071.39	1256.45	1498.64	991.96	1053.50	1001.19	808.29	1281.15	629.20	716.13	1244.32	998.18	971.51	1054.08	1280.70
1978	1080.17	1411.29	1174.36	1378.82	1593.06	1080.17	1150.93	1082.86	954.17	1383.16	682.76	772.89	1356.77	1054.17	1077.35	1149.73	1280.09
1979	1190.11	1560.59	1290.78	1550.81	1617.85	1088.21	1251.82	1238.07	1094.47	1545.03	748.48	815.61	1468.45	1146.37	1156.09	1251.29	1251.29

1. Production wkrs BM,QM,MA,SM,OS.

2. Mean of Mech & Elec Equip & Supplies MM,BT,EN,BR,EM, IC,SIC 593 & 3511.

3. Mean of Instruments & Related Production and Metal Working IM,OM,NK,HT,PM,MC,SIC 38 & 354.

4. Aircraft parts AD,AT,AX,AO,AE,AM,PR,JD,AZ,SIC 372.

5. Motor vehicles AB,AS,SIC 371.

6. Production wkrs AW,AC,AG.

7. Special Industrial Equip FT,MT,ET,DS,AQ.

8. Ord & Accessories TM,GM,MN,SIC 348.

9. Electronics Components and Semiconductor 3679, 3674.

10. Construction wkrs EA,CE,EO,CM,BU,SW,UT.

11. Health services HM,DT,SIC 80.

12. Finance, Ins. & Real Estate YH,PH,LN,NC,DP,PC,SIC 6.

13. Trucking & Warehousing SK,DK,MS,SH,AK,SIC 42.

14. Printing and Publishing JO,LI,DM,MU,PH,SIC 27.

15. Radio & TV Broadcasting RM,CT,IS,SIC 483.

Source: Economic Report of the President 1980: Index of all services less rent (in base 1979 = 100); and Bureau of Labor Statistics.

APPENDIX F

MILITARY END STRENGTH 1956-1979

	ARMY	NAVY	USMC	USAF	DOD
1956	905,711	591,996	182,971	764,541	2,445,219
1957	885,056	597,859	183,427	776,507	2,442,849
1958	792,508	563,506	172,754	735,738	2,264,506
1959	758,458	552,221	159,506	704,543	2,174,728
1960	770,112	544,040	154,242	680,639	2,149,033
1961	756,932	551,603	160,438	689,556	2,158,529
1962	948,597	584,071	173,615	746,183	2,452,466
1963	865,768	583,596	172,541	732,626	2,354,531
1964	860,514	584,700	172,567	720,372	2,338,153
1965	854,929	587,183	172,640	690,177	2,304,929
1966	1,079,682	658,635	240,911	753,477	2,732,735
1967	1,296,603	663,831	261,584	758,648	2,980,666
1968	1,401,727	673,610	282,697	761,507	3,119,541
1969	1,337,047	684,145	284,073	722,936	3,028,201
1970	1,153,013	605,899	234,706	657,402	2,651,110
1971	971,872	542,298	190,604	624,980	2,329,754
1972	686,695	510,669	178,395	599,774	1,975,533
1973	681,972	490,009	176,816	571,790	1,920,587
1974	647,466	475,479	170,062	529,067	1,849,074
1975	678,324	466,121	177,360	503,176	1,824,981
1976	680,077	460,231	171,204	479,624	1,791,136
1977	680,062	462,176	173,057	469,878	1,785,173
1978	669,515	463,217	173,427	469,862	1,775,021
1979	657,184	457,102	167,021	458,953	1,740,260

Source: Reference [18].

CAREER ELIGIBLE TO REENLIST

	ARMY	NAVY	USMC	USAF	DOD
1956	67,141	45,279	8,120	60,667	181,207
1957	63,198	46,409	9,873	35,057	154,537
1958	69,360	28,632	8,149	37,324	143,465
1959	51,204	15,087	6,882	38,707	111,880
1960	44,548	17,324	5,788	30,297	97,957
1961	61,945	22,553	5,758	66,679	157,935
1962	68,178	34,557	8,101	86,270	197,106
1963	59,155	32,781	8,858	63,626	164,780
1964	67,682	27,537	8,399	65,921	169,539
1965	60,208	29,108	7,698	94,147	191,161
1966	51,887	29,008	5,538	77,039	163,472
1967	53,354	35,294	6,298	58,315	153,261
1968	51,420	32,926	6,466	64,564	155,376
1969	46,395	31,156	6,818	77,906	152,275
1970	63,115	35,632	6,263	61,700	166,710
1971	79,899	32,925	7,493	52,996	173,313
1972	62,097	31,170	6,413	56,572	156,252
1973	49,133	38,647	8,053	60,855	156,688
1974	54,739	46,213	8,609	52,095	161,656
1975	53,639	42,261	9,283	56,039	161,222
1976	52,706	30,489	7,225	59,563	150,983
1977	71,278	28,785	8,433	51,706	160,202
1978	76,876	30,642	9,622	45,363	162,503
1979	81,940	29,614	15,987	44,457	171,990

Source: Reference [18].

ECONOMIC ACTIVITY INDICATORS

	NET NAT. INCOME	MORTAGE RATE	GNP
1956	350.8	4.85	414.7
1957	366.9	5.12	434.4
1958	367.7	5.00	444.2
1959	399.6	5.52	482.7
1960	414.5	5.71	502.6
1961	426.1	5.97	518.2
1962	453.7	5.93	554.9
1963	478.1	5.81	585.1
1964	517.3	5.90	631.7
1965	559.0	5.83	681.2
1966	610.1	6.40	739.6
1967	645.0	6.53	793.5
1968	714.4	7.12	865.7
1969	771.0	7.99	932.1
1970	800.5	8.52	977.1
1971	859.4	7.75	1056.1
1972	941.8	7.64	1155.2
1973	1053.9	7.95	1289.1
1974	1135.7	8.92	1413.2
1975	1207.6	9.01	1516.3
1976	1273.0	8.99	1702.2
1977	1340.5	9.01	1899.5
1978	1399.2	9.54	2127.6
1979	1431.6	11.37	2368.8

Source: The Federal Reserve Bulletin, published monthly by the Federal
Reserve System.

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